
# DEPARTMENT OF ENERGY: AN ORGANIZATIONAL LOOK AT AMERICA'S NUCLEAR DETERRENT

GRADUATE RESEARCH PAPER

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# DEPARTMENT OF ENERGY: AN ORGANIZATIONAL LOOK AT AMERICA'S NUCLEAR DETERRENT

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## Abstract

The primary motivation for this research is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, called into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Similarly, the current uncertain and changing strategic security environment, shrinking budgets, and aging nuclear force structure and nuclear production complex, raise questions as to the long-term effectiveness and credibility of the U.S. nuclear deterrent.

A literature review and case study interviews with mid-level managers provide valuable insight into DOE organizational cultural challenges. The results from the literature review and interviews were analyzed and presented. This research highlights that while DOE's culture is improving, opportunities exist for meaningful cultural change. Capitalizing on these opportunities provides for the long-term effectiveness and credibility of America's nuclear deterrent.

*To my loving and patient wife and children: Thank you for supporting me through this program and this research project. Your sacrifices made this all possible.*

## Acknowledgments

First, I would like to express my sincere gratitude to my research advisor Dr. Jeffrey Ogden for his patience, support, and guidance during the course of this research project.

Second, I would also like to thank those focused interview participants who enthusiastically shared their knowledge and experience, which contributed to answering the research questions of this study.

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David O. Pabst

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# I. Introduction

## Overview

An analysis of the Department of Energy's (DOE) organizational challenges is necessary in determining the long-term effectiveness of the nuclear enterprise. In the years following the Cold War, DOE experienced numerous safety and security incidents at its national laboratories, signaling a growing culture of apathy toward nuclear weapons and the missions they serve. More importantly, these events call into question the safety, security, and effectiveness of the nuclear enterprise and its deterrent value (President's Foreign Intelligence Advisory Board 1999; Government Accountability Office 2012). Unless DOE addresses these concerns, there could be lasting negative implications for America's nuclear deterrent force. Therefore, an exploratory examination of DOE is appropriate to identify and understand what organizational cultural challenges DOE faces and how those challenges impact the effectiveness of the nuclear enterprise. An understanding of DOE organizational cultural challenges is useful in determining the proper framework for long-term enterprise effectiveness.

## Background

Nuclear weapons play an integral part in the National Security Strategy of the United States (National Security Strategy 2015). Since the early days of the Cold War, nuclear weapons have formed the foundational basis of U.S. national security through the concept of deterrence. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (2010), defines deterrence as "the prevention of action by the existence of a credible threat of unacceptable counteraction and/or belief that the cost

of action outweighs the perceived benefits." The crux of U.S. deterrence is credibility- the belief U.S. adversaries have that a threat will be carried out. Every administration since the beginning of the Cold War has emphasized the need to sustain a credible nuclear deterrent, as nuclear weapons provide the ultimate guarantee against major war (Congressional Advisory Panel 2014). Thus, the Department of Energy serves to maintain a credible nuclear deterrent by ensuring a safe, secure, and effective nuclear enterprise.

Following the Cold War, apathy and neglect replaced the focus and support of nuclear weapons and deterrence within the DOE nuclear complex. A growing lack of interest and attention among senior executive and congressional leaders immediately led to reducing the role of nuclear weapons in national security policy and planning (Ritchie 2009). This resulted in a dramatic reduction in the size of the nuclear stockpile (see Figure 1), as well as the institution of a nuclear weapons testing moratorium (Turpen

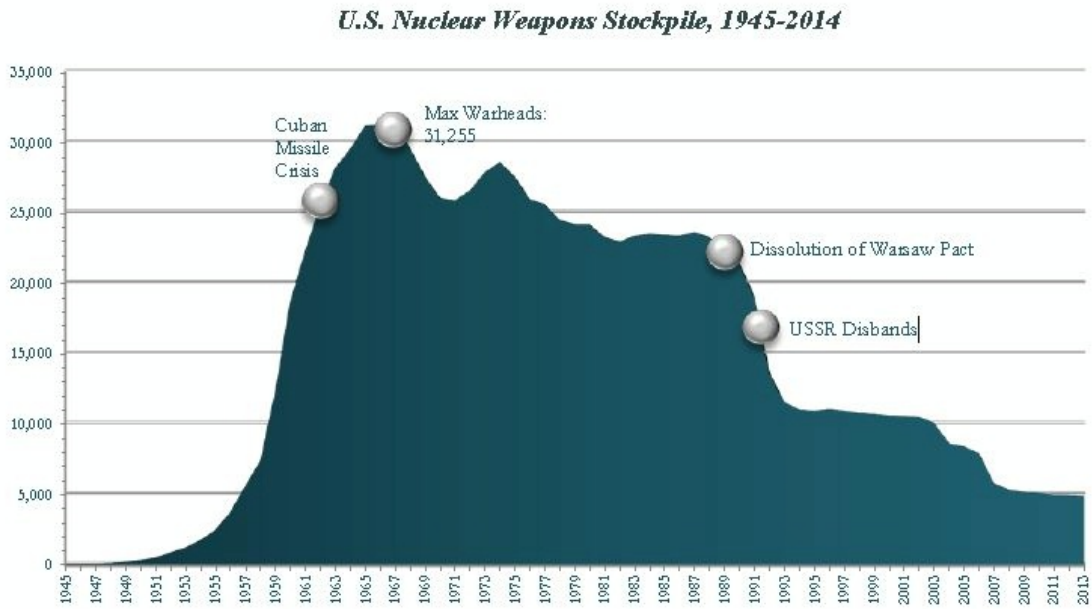



**Figure 1. U.S. Nuclear Stockpile (1945-2014)**

2009). In similar effort, Congress reduced funding for the nuclear force structure, modernization programs, and the nuclear weapons production complex, forcing DOE and the weapons complex to adapt to a new environment (Ritchie 2009; Turpen 2009). This led to the deterioration of morale and degradation of focus toward nuclear weapons at DOE's weapons laboratories, culminating in numerous safety and security lapses during the mid to late 1990s (Turpen 2009).

While present day efforts seek to reinvigorate America's nuclear deterrent force, new and emerging challenges threaten DOE's ability to maintain a safe, secure, and effective nuclear enterprise. The first of these is the aging nuclear arsenal. The U.S. nuclear stockpile is the oldest it has ever been. No new weapons have been developed since the end of the Cold War. Consequently, the weapons in the stockpile, built about 25 to 30 years ago, are well past their original design life (National Nuclear Security Administration 2015). Additionally, reductions in the stockpile over the last two decades results in the smallest stockpile size since the Eisenhower administration. It is designated for further reductions by 2018, as a result of the new Strategic Arms Reduction Treaty (START). Because the U.S. maintains a policy of no new weapons designs or nuclear testing, confidence in the credibility and effectiveness of the nuclear deterrent must remain high, especially in today's uncertain and changing strategic security environment (National Nuclear Security Administration 2015). While U.S. systems are aging, adversary nations, like China and Russia are modernizing their nuclear arsenals (Joint Defense Science Board 2010). Therefore, ensuring a safe, secure, and effective enterprise provides a hedge against any future surprise. A key component of an effective deterrent is a strong cadre of highly skilled and qualified scientists and engineers (Turpen

2009). However, with shrinking budgets and a large percentage of the workforce approaching retirement age, the long-term credibility of the deterrent is in doubt.

## Problem Statement

The primary motivation for this study is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, call into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Furthermore, incidents such as these draw extensive national attention and public scrutiny, which continues today. Thus given DOE's sordid security and safety record and the challenging, uncertain, and changing strategic security environment, it is appropriate to conduct a holistic review of the current DOE organizational culture in order to examine the safety, security, and effectiveness of the nuclear enterprise. Specifically, this study seeks to answer the overarching question, "How does the current DOE organizational culture impact the long-term effectiveness of the nuclear enterprise?"

## Research Objectives and Investigative Questions

The objective of this research is to assess the long-term effectiveness of the nuclear enterprise given DOE's current organizational culture. To achieve this objective, this study performs a detailed literature review to identify and understand major

organizational cultural challenges. The literature review provides the context to address the following investigative questions:

IQ1. What role does DOE play in the nuclear enterprise?

IQ2. How is DOE organized?

IQ3. What current organizational cultural challenges does DOE face?

Furthermore, high reliability organization theory provides a theoretical framework to analyze the organizational culture of DOE. The elements of high reliability organization theory this study uses in this examination are (1) preoccupation with failure, (2) reluctance to simplify interpretations, (3) sensitivity to operations, (4) commitment to resilience, and (5) deference to expertise. Specifically these elements assist in garnering organizational management perspectives instrumental in laying a framework for the long-term effectiveness of the nuclear enterprise. To meet this objective, this research addresses the following additional investigative questions:

IQ4. What opportunities exist for enduring cultural change?

IQ5. What are the barriers to cultural change?

IQ6. What are the benefits of cultural change to the long-term effectiveness of the nuclear enterprise?

**Research Focus**

This research analyzes the organizational culture of DOE to identify and understand any challenges and their long-term impact on the effectiveness of the nuclear deterrent mission. DOE is a conglomerate of agencies responsible for the

mission areas of energy, science, nuclear weapons, and environmental clean-up (Glauthier and Cohon 2015). The vastness of these agencies and mission sets presents a scope too large for this research paper. Consequently, this research restricts the focus solely to DOE's role within the nuclear enterprise. Specifically, the research centers on the National Nuclear Security Administration (NNSA), since it is the governing entity with immediate oversight responsibility of the nation's nuclear weapons stockpile and mission. Furthermore, the focus of this research is not on every division within NNSA, but rather those divisions responsible for maintaining the safety, security, and effectiveness of the U.S. nuclear deterrent. Recommendations from the analysis of NNSA's organizational culture provide a framework for the long-term effectiveness of the nuclear deterrent mission.

## Methodology

To identify and understand NNSA's organizational cultural challenges and their impact on the effectiveness of the nuclear deterrent mission, this research employs the case study research method. Case studies seek to provide data points and insights on the effectiveness of the current organizational culture. The primary means to collect data is through focused interviews of middle management level employees across the organization. However, this research also draws data from existing literature and site visits. A qualitative analysis of the information from the interviews, existing literature, site visits provide insights to develop a framework for the long-term effectiveness of the enterprise.

## Assumptions

A couple of assumptions are appropriate for this study. First, the nature of the focused interview questions is appropriate and yields meaningful information and insight into the effectiveness of NNSA's organizational culture. Second, the information from the interviews with middle managers is substantial and useful in developing a framework for the long-term effectiveness of the organizational culture.

## Limitations

This study contains several limitations. First, due to the vastness of its mission areas and the constraint of time this research focuses solely on those divisions within NNSA responsible for maintaining the safety, security, and effectiveness of the nuclear enterprise. Second, this research will not address the budgeting processes or other aspects of the budget with respect to the organization or its culture. While budgets and the managing thereof are an important aspect of an organization and its culture, the high reliability organization theoretical lens through which this research intends to view and analyze NNSA's organizational culture does not focus on this aspect of culture. Third, given the time constraints, the sample size of respondents for this case is less than ten.

## Implications

While the amount of literature addressing the many challenges facing NNSA is persistent, there is a lack of empirical evidence providing any clear or detailed framework for cultural change. Some of the literature discusses cultural elements and

the challenges they present to the overall effectiveness of the organization (Congressional Advisory Panel 2014; National Research Council 2013; Hecker 2012, National Research Council 2012; GAO 2012, Defense Science Board 2008; GAO 2007). However, many of the recommendations in the literature focus on organizational structure reform rather than cultural reform. The recommendations that focus on cultural reform seem generic and ambiguous. Furthermore, it is not abundantly clear how many challenges if any, continue to permeate NNSA culture. Thus the aim of this research is to cover the gap in empirical evidence by providing answers to previously mentioned research questions. Specifically, this should provide the foundational knowledge and understanding of the role DOE plays in the nuclear enterprise, how DOE is organized, the current organizational cultural challenges DOE faces, the opportunities that exist for enduring cultural change, the barriers to cultural change, and the benefits of cultural change to the long-term effectiveness of the nuclear enterprise.

**Summary**

The history of safety and security lapses within DOE combined with the challenges of an aging arsenal and force structure and an uncertain and changing strategic security environment, call into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Thus, it is appropriate to conduct a holistic review of the current DOE organizational culture in order to examine the long-term safety, security, and effectiveness of the nuclear enterprise. The literature review in chapter 2 provides and overview of the history, organization, and

organizational cultural challenges of DOE, as well as the theoretical framework of high reliability organizations. Chapter 3 describes the methodology this research uses to analyze the organizational culture of DOE. Chapter 4 presents the results of the data and research analysis. Finally, chapter 5 outlines conclusions from the research findings and discusses their implications.

## II. Literature Review

### Overview

To lay the foundation for this study this chapter discusses several bodies of literature. First, this chapter provides a brief history of the Department of Energy (DOE) and how it came to play a role in the nuclear enterprise. Second, this paper examines the current organizational construct of DoE and its nuclear enterprise. Third, the document explores literature identifying national guidance and policy for the conduct of the nuclear enterprise. Fourth, this study discusses relevant literature spanning the last decade analyzing DOE organizational effectiveness. Finally, this manuscript reviews and discusses the theoretical perspective of high reliability organizations, which may be a useful in examining DOE organizational culture.

### History of the Department of Energy

A basic knowledge of the history of DOE, to include the reason it was created, is helpful in understanding its role in the nuclear enterprise. DOE traces its origin to the end of World War II and the Manhattan Project. Following the war and after much debate, President Harry Truman signed into law the Atomic Energy Act (Fehner and Hall 1994). The Atomic Energy Act established the Atomic Energy Commission (AEC) in an effort to foster and control the peacetime development of military and civil applications of nuclear energy and science. The Act also served to transfer control of atomic energy from the military to the civilian controlled AEC (Buck 1983). Initially the impetus of the new independent organization was "to keep nuclear weapons out of the hands of the military," but the paramount objective of the AEC was to assure the common defense and

security while also pursuing civil applications of atomic energy (Defense Science Board 2006; Fehner and Hall 1994). Congress granted the AEC enormous power and independence to carry out its all-important responsibilities. However, as part of the Act, three advisory committees were created to include the Congressional Joint Committee on Atomic Energy, which provided congressional oversight. The other two advisory committees were the Military Liaison Committee, which provided an avenue for a military voice to the Commission, and General Advisory Committee of outstanding scientists (Buck 1983). A graphical depiction of the newly created organization is presented in Appendix A.

Also, developing from the Manhattan Project and continuing on in the early days of the AEC was an institutional framework known as Federally Funded Research and Development Centers (FFRDCs). The fundamental purpose of FFRDCs were to attract the nation's top scientific and engineering talent in order to address the enduring scientific and technical national security challenges that could not be achieved using existing government or contractor resources (Hruby, et al. 2011). However, due to the need for security, all the facilities to include the production facilities, nuclear reactors, and laboratories were government-owned and contractor operated (GOCO). Furthermore the information and research results from these facilities was under direct control of the AEC (Buck 1983). This GOCO model came to form the infrastructure of the present day national laboratories and nuclear enterprise production facilities. From its beginnings GOCO model was nurtured by a productive partnership between the AEC and Congress' Joint Committee on Atomic Energy (JCAE). AEC sponsorship of the GOCO laboratories and production facilities were generally successful arrangements for the nuclear

enterprise and weapons development. This success continued until the energy crisis of the 1970s led to the disestablishment of the AEC and the formation of the Department of Energy in 1977. The JCAE also disbanded and was replaced by the Nuclear Regulatory Commission. At that time it was determined that custody of the nuclear weapons program would be transferred to the newly created DOE rather than DOD, due largely in part to the arms control climate at the time (Defense Science Board 2006). Figure 2 depicts the organizational journey of the nuclear enterprise from the Manhattan Project to DOE.

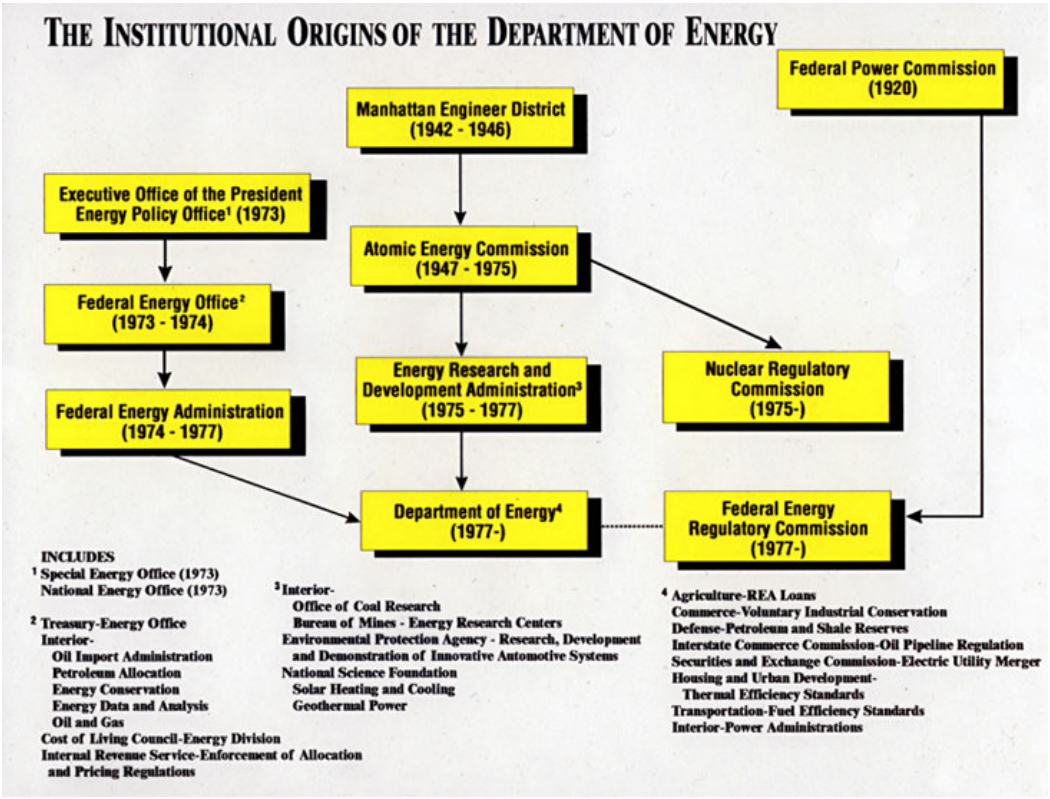



**Figure 2. The Institutional Origins of DOE**

Seemingly, the marriage of the nuclear weapons program with DOE was anything but smooth. When DOE was created, it merged together "two very different

programmatic traditions" without much thought to the natural congruence of the missions and programmatic approaches (Loeber 2002; Defense Science Board 2006). One tradition consisted of a nuclear weapons program that was characterized by a bureaucratically centralized and security oriented organization with a close partnership to the military. The other tradition involved a conglomeration of agencies, offices, commissions which were scattered throughout the federal government and had seldom coordinated their activities or policies (Loeber 2002).

During the 1980s and 1990s, the DOE's missions, policies, and management methods highlighted the incongruent nature of these melded traditions. DOE management approaches were not tailored to the needs of the nuclear enterprise, which greatly hindered the effectiveness of the weapons program. Similarly, the effectiveness of the GOCO model began to deteriorate as DOE exercised ever more detailed authority over the organizations (Defense Science Board 2006). These developing bureaucratic hinderances to effective nuclear enterprise operations elicited the conduct of several high-level studies. In 1995, the Secretary of Energy Advisory Board's report on *Alternative Futures for the Department of Energy National Laboratories*, commonly called the Galvin Report, found that the GOCO had been considerably enfeebled under increasing DOE micromanagement and excessive oversight. The report was seemingly direct in its criticism of DOE's management methods with regard to the nuclear weapons program:

> *"The net effect is that thousands of people are engaged on the government payroll to oversee and prescribe tens of thousands of how-to functions. The laboratories must staff up or reallocate the resources of its people to be responsive to such myriads of directives; more and more of the science intended resources are having to be redirected to the phenomenon of accountability versus producing science and technology benefits."*

In March 1997, the Institute for Defense Analyses, in its study, *The Organization and Management of the Nuclear Weapons Program*, portrayed the concern for DOE's management and oversight practices in the following manner:

> "*The current system can best be described as one in which everybody reviews everything until everyone is satisfied. The "process" is ad hoc…There is no consensus among all these reviewers and checkers and checkers of checkers regarding the desired end-state for a facility. That is to say, that there is no agreement on what it means to be safe. Consequently, each of the organizations that review a document, decision, or process does so from its own perspective and insists that the facility meet its priority requirements for safety*" (Richanbach, et al. 1997).

In 1999, the Commission on Maintaining United States Nuclear Weapons Expertise, commonly called the Chiles Commission, characterized the impact of DOE's micromanagement and excessive oversight methods with the following:

> "*The current stewards of the stockpile experience frustration caused by the high level of DOE micromanagement in the workplace. Worker feelings range from anger to resigned despair. Uncertainties are created by the overlapping and unclear government roles in supervision of operations. At the extreme, some felt that supervisory bureaucracies had become the prime customer of their facility--that is, pleasing the overseers has become equally or more important than accomplishing their stewardship mission*."

In October 1999, recognizing the discord inherent in the situation and to address security issues within the nuclear enterprise, President Bill Clinton signed the National Defense Authorization Act for Fiscal Year 2000, which under Title 32 established a new semi-autonomous agency within DOE, the National Nuclear Security Administration (NNSA). Under the provisions of the law, the responsibility of managing the nuclear weapons complex transferred from DOE to NNSA (National Defense Authorization Act for Fiscal Year 2000 1999).

## Organization of the Department of Energy

Since its inception in 1977, the Department of Energy has undergone various reformations and organizational changes. Some of these were in response to the challenges of merging two incongruent traditions, as the historical portion of this study illustrates. All the changes culminate in the present day look of DOE, which is a conglomerate of agencies responsible for the mission areas of energy, science, nuclear weapons, and environmental clean-up (Glauthier and Cohon 2015). Figure 3 shows the

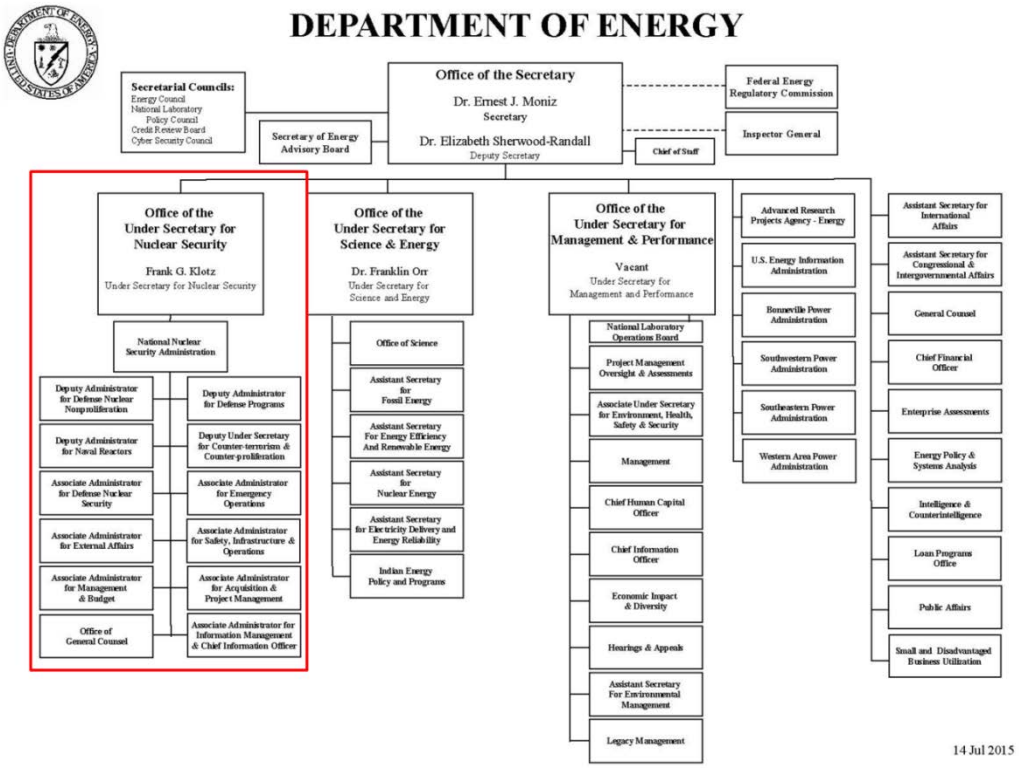



**Figure 3. Present Day Organization of DOE**

current organization of DOE. The portion of the chart inside the red rectangle is the Office of the Undersecretary for Nuclear Security. The head of this office is also the administrator of NNSA. This portion of DOE's organization forms the focus area for this study.

### *National Nuclear Security Administration*

Established by Congress in 2000, NNSA is a separate agency within DOE responsible for enhancing national security through the military application of nuclear weapons science. Figure 4 depicts NNSA's current organization. NNSA has many

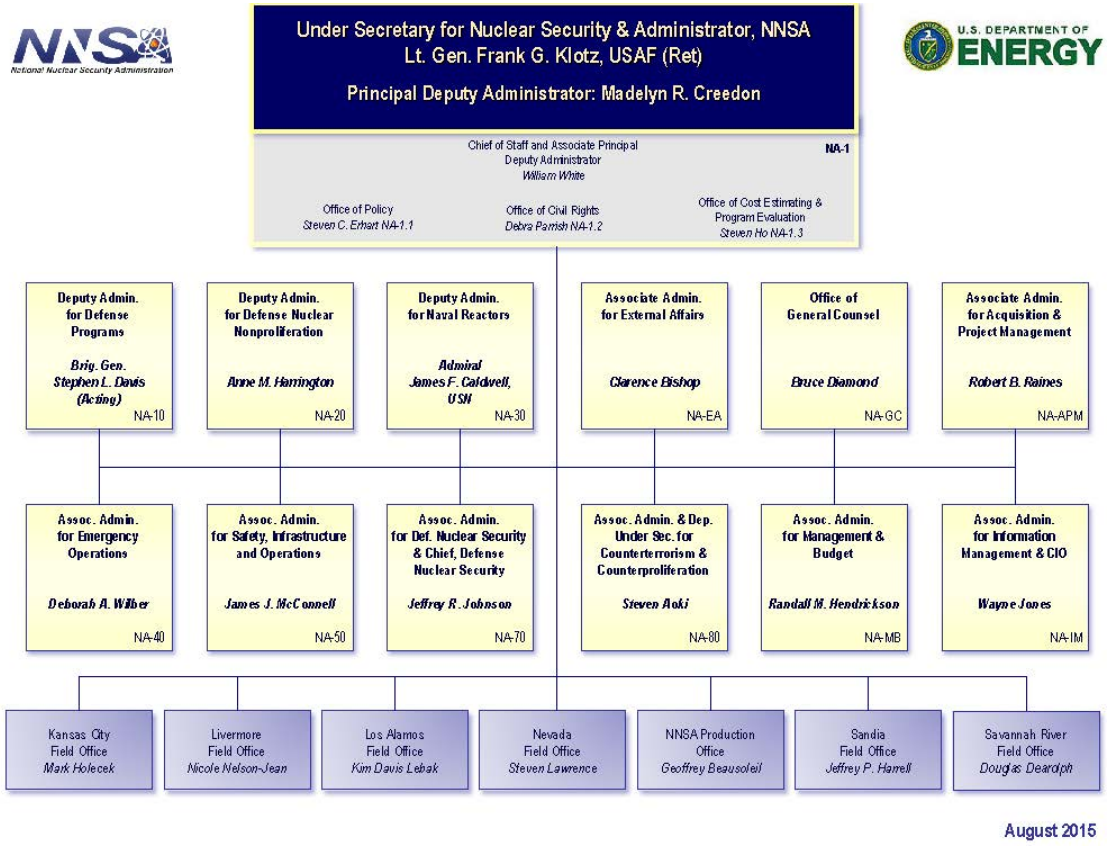



**Figure 4. Current NNSA Organization**

mission areas for which it is responsible. These mission areas are listed below.

- *Maintaining the safety, security, and effectiveness of the U.S. nuclear deterrent without nuclear testing.*
- *Strengthening science, technology, and engineering capabilities and modernizing the national security infrastructure.*
- *Reducing global nuclear security threats.*

- *Providing safe and effective integrated nuclear propulsion systems for the U.S. Navy* (National Nuclear Security Administration 2015).

Although NNSA has many mission areas of focus, the nucleaus of this research are the agencies and divisions that directly impact the safety, security and effectiveness of the nuclear enterprise. Figure 5 illustrates the elements that make up the nuclear enterprise (Appendix B provides a more detailed overview of each element of the nuclear enterprise).

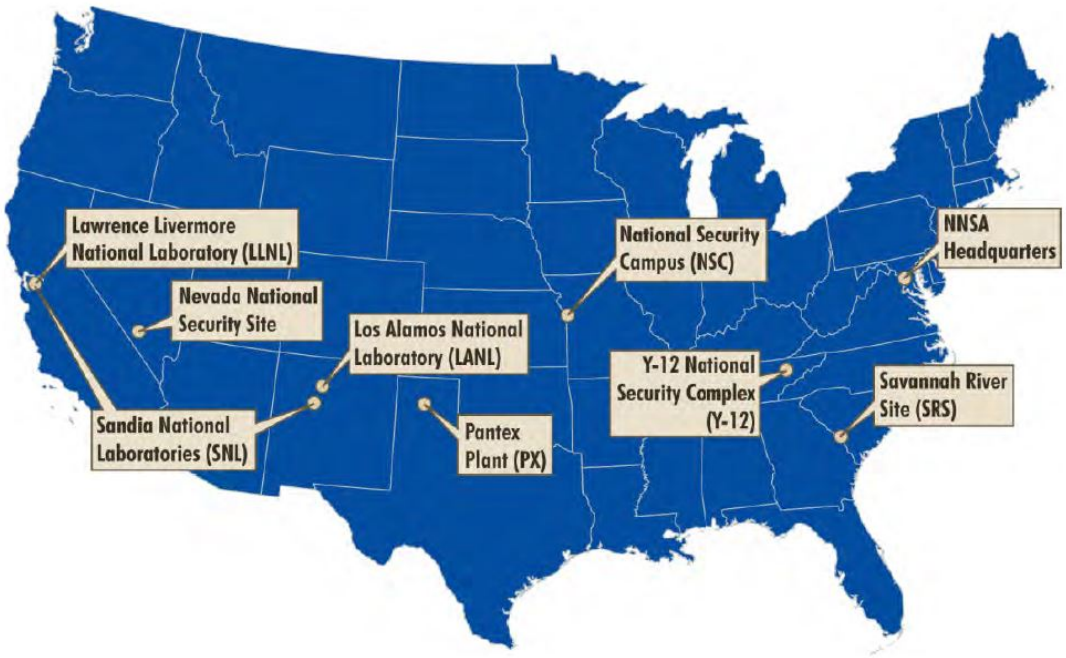



**Figure 5. NNSA's Nuclear Security Enterprise**

## National Guidance and Policy

There are a number of documents that provide the necessary guidance and policy framework for the conduct of the nuclear enterprise. These are the 2015 *National Security Strategy*; the 2010 *Nuclear Posture Review*; the 2013 Presidential Policy

Directive 24, *Nuclear Weapons Employment Guidance* (PPD-24); and the 2003 National Security Presidential Directive 28, *United States Nuclear Weapons Command and Control, Safety, and Security* (NSPD-28).

### *National Security Strategy*

The 2015 *National Security Strategy* identifies the greatest threat to the nation's security and well-being is the potential use of nuclear weapons by irresponsible states and terrorists. In response, the President sets as a national security priority and directive to "invest the resources necessary to maintain—without testing—a safe, secure, and effective nuclear deterrent that preserves strategic stability" (National Security Strategy 2015).

### *Nuclear Posture Review*

To bring about the President's national security priorities, the 2010 *Nuclear Posture Review* outlines the following guidelines relative to the maintaining a safe, secure, and effective nuclear deterrent.

- *The United States will not conduct nuclear testing and will pursue ratification and entry into force of the Comprehensive Nuclear Test Ban Treaty.*
- *The United States will not develop new nuclear warheads. Life Extension Programs (LEPs) will use only nuclear components based upon previously tested design, and will not support new military missions or provide for new military capabilities.*
- *The United States will study options for ensuring the safety, security, and reliability of nuclear warheads on a case-by-case basis, consistent with the congressionally mandated Stockpile Management Program. The full range of LEP approaches will be considered: refurbishment of existing warheads, reuse of nuclear components from different warheads, and replacement of nuclear components.*

- *In any decision to proceed to engineering development for warhead LEPs, the United States will give strong preference to options for refurbishment or reuse. Replacement of nuclear components would be undertaken only if critical Stockpile Management Program goals could not be met and if specifically authorized by the President and approved by Congress.*

- *The United States will retain the smallest possible nuclear stockpile consistent with our need to deter adversaries, reassure our allies, and hedge against technical or geopolitical surprise* (Nuclear Posture Review 2010).

Furthermore, based upon the recognition that much of the current physical infrastructure is aging and that the national laboratories have found it difficult to attract and retain the best and brightest scientists and engineers of the next generation, the NPR concludes that the following is needed to sustain a safe, secure, and effective nuclear enterprise.

- *The science, technology and engineering base vital for stockpile stewardship must be strengthened.*

- *Increased investments in the nuclear weapons complex of facilities and personnel are required to ensure the long-term safety, security, and effectiveness of our nuclear arsenal* (Nuclear Posture Review 2010).

***Presidential Policy Directive 24 (PPD-24)***

In 2013, President Obama delivered a new Presidential Policy Directive, *Nuclear Weapons Employment Guidance* (PPD-24) that "aligns U.S. nuclear policies to the 21st century security environment" (National Nuclear Security Administration 2015). Most of the guidance contained in the directive is classified and consequently cannot be displayed or discussed in this study. However, in the unclassified portion of the directive, the President provides new guidance for the conduct of the nuclear stockpile mission. In this guidance the President communicates the following:

- *Affirmed that the United States would maintain a credible deterrent to convince its adversaries that the consequences of attacking the Nation or its allies and partners would far outweigh any potential benefit to be gained through an attack.*
- *Modified the principles for hedging against technological or geopolitical risk to create more effective management of the stockpile.*
- *Reaffirmed that the United States would maintain a safe, secure, and effective deterrent for itself and its allies and partners for as long as nuclear weapons exist* (National Nuclear Security Administration 2015).

***National Security Presidential Directive 28 (NSPD-28)***

In June 2003, National Security Presidential Directive 28 provided unequivocal guidance on nuclear command and control and on nuclear weapons safety and security. Similar to PPD-24, most of the guidance contained in NSPD-28 is classified and will not be discussed in this study. However, suffice it to say that a portion of the directive is of particular relevance to the nuclear security enterprise. This relevant portion mandates that NNSA conduct a broad range of research and development (R&D) activities pertaining to the safety, security, and reliability of the stockpile. This 2003 mandate continues to influence LEP design and production decisions and funding for R&D efforts (National Nuclear Security Administration 2015).

## Relevant Literature

There is an abundant amount of literature that examines the organizational challenges of NNSA. The scope of this section lends itself to a review of the pertinent findings occurring over the course of the last decade. Table 1 identifies the relevant studies that discuss the organizational cultural challenges of NNSA. The subsequent paragraphs examine these challenges in greater detail.

**Table 1. NNSA Organizational Cultural Challenges**

| Challenge | Reference |
|---|---|
| Lack of national leadership consensus | Congressional Advisory Panel (2014) |
| | Defense Science Board Task Force (2006) |
| | |
| Lack of mission driven culture | Congressional Advisory Board (2014) |
| | Haber, et al. (2013) |
| | Hecker (2012) |
| | National Research Council (2012) |
| | Government Accountability Office (2012) |
| | Turpen (2009) |
| | |
| Lack of critical skills | National Research Council (2015) |
| | Congressional Advisory Panel (2014) |
| | National Research Council (2013) |
| | Hecker (2012) |
| | Government Accountability Office (2012) |
| | Defense Science Board (2008) |

### *Lack of National Leadership Consensus*

There is need for strong national leadership to navigate the nuclear enterprise in the growingly complex global security environment. The nuclear enterprise depends on national leadership to provide the guidance, strategy, and resources necessary to accomplish its missions (Congressional Advisory Panel 2014). As previously described, national leadership provides policy guidance in the *National Security Strategy, Nuclear Posture Review, Presidential Policy Directives* and *National Security Presidential Directives*. While such policy guidance provides the necessary support for nuclear security enterprise missions, it does not "resolve and delineate program and resource priorities among those missions" (Congressional Advisory Panel 2014). Consequently, as studies also indicate, there is no actionable direction or agreement on priorities, and

there are sharp differences across the government on the role of the U.S. nuclear deterrent. For many, the top priority of the nuclear deterrent is to support non-proliferation initiatives. Others place priority on sustainment and stewardship of the nuclear stockpile. There are still others who view leadership in nuclear science and engineering as the core capability that guarantees America's nuclear deterrent (Defense Science Board 2006; Congressional Advisory Panel 2014). These competing priorities are matters that require resolution from the most senior leaders in the Executive Branch and Congress.

A significant barrier to the establishment of priorities and directional guidance, however, lies in the continual lack of consensus among national leadership on nuclear capabilities. Previous literature suggests there are distinct differences in views on how the U.S. nuclear deterrent should shape the security environment. For instance, a segment of the national leadership holds the view that transforming the nuclear stockpile is the wrong approach in shaping the security environment (Defense Science Board 2006). This is consistent with the Congressional Advisory Board (2014) report citing "a dwindling number of members of Congress advocate for the needs of the nuclear enterprise." Furthermore, the report chronicles asymmetrical communication and incongruent views among legislators in both the House of Representatives and the Senate as significant roadblocks to the effectiveness and clarity of the nuclear enterprise and its missions. Without a consensus and clarity of direction from national leadership, the nuclear enterprise in essence has been left to "muddle through" the progressively complex global security environment (Congressional Advisory Panel 2014).

### *Recommendations*

A safe, secure, and effective nuclear deterrent requires focused, consistent leadership and direction from both the Executive and Legislative branches. Such a leadership construct provides consistent expectations and direction for the enterprise (Congressional Advisory Panel 2014). To this end, previous literature outlines the following courses of action the Executive and Legislative branches should implement to fulfill the required and needed leadership roles:

- *The President should provide guidance and oversight sufficient to direct and align nuclear security policies, plans, programs, and budgets across departments.*
- *Congress should establish new mechanisms to strengthen and unify its leadership and oversight of the nuclear enterprise and its missions* (Congressional Advisory Panel 2014).

### *Lack of Mission Driven Culture*

In addition to strong national leadership, a productive and mission driven culture is necessary to operate effectively in today's security environment. The strength and drive of an organization stems from the mutual reinforcement of management practices and culture. As one body of literature states, "successful organizational cultures share two common attributes: leadership and accountability" (Congressional Advisory Panel 2014). Recent studies indicate, however, that the current culture of NNSA is anything but successful. According to the Congressional Advisory Panel (2014); Haber, et al. (2013); Hecker (2012); National Research Council (2012); Government Accountability Office (2012); and Turpen (2009), governance and oversight; leadership; accountability;

communication; trust; and risk management challenges plague NNSA organizational culture; creating an environment of "turf battles" and eroding morale.

### Governance and Oversight

Multiple studies indicate that NNSA's governance of the national laboratories is ineffective and leads to oversight measures that are excessive, burdensome, and stifling (Government Accountability Office 2012; National Research Council 2012; Hecker 2012; Turpen 2009). Siegfried Hecker (2012), former director of Los Alamos Laboratory, in his testimony before the House Arms Services Committee, explains that the governance approach is dissolving the successful partnership between NNSA and the laboratories. He further states that the excessive oversight increases the "cost of doing business" and compromises the laboratories' ability to effectively accomplish the mission (Hecker 2012). The findings of Turpen (2009) and the National Research Council (2012) are congruent with those of Hecker. According to their reports, there is an erosion of trust in the partnership of NNSA and the laboratories. In its place, NNSA employs an oversight approach in which NNSA dictates the conduct of science and engineering operations at the laboratories. Turpen (2009) characterizes this oversight approach in the following manner:

> "Rather than the NNSA telling the Laboratories "what" and the Labs responding with "how," the Labs are defining "what" and the NNSA (in particular, the site offices) is micromanaging "how."

This governing approach precludes NNSA from taking full advantage of the intellectual and management skills resident in the laboratories. Instead, the excessive and stifling

oversight puts the quality of the science and engineering at risk, as the scientists and engineers are not encouraged to share their creative ideas (National Research Council 2012). Hecker (2013) notes, however, that the deterioration of the relationship between NNSA and the laboratories does not fall squarely on the shoulders of NNSA, but is "the accumulation of changes driven primarily by Congress for greater accountability" at the laboratories.

### Leadership

In the Haber, et al. (2013) study, respondents express concern over NNSA leadership commitment to making safety a priority. The prevailing perception among the staff is that senior leaders only view safety to be a priority when there is an accident or event. Evidence of this is in the belief that some facility managers hesitate to halt operations for safety issues if it appears they will impact the mission (Haber, et al. 2013). The study also suggests a perception within NNSA that senior leaders do not value the knowledge or expertise of the staff. Indicative of this is leadership often makes decisions without making any attempt to listen to or engage the staff (Haber, et al. 2013). Lastly, both Haber, et al. (2013) and the Congressional Advisory Panel (2014) note the lack of clear and consistent communication by senior leaders concerning the priorities, vision, and strategy, result of which causes frustration and questioning among the workforce as to the value of the mission.

### Accountability

The Congressional Advisory Panel (2014) review of NNSA reveals a culture where personnel are not held accountable for their contributions to the mission. Haber, et

al. (2013) adds further that many supervisors fail to provide informal feedback to their employees. Consequently, poor performers are not held accountable, often resulting in deliverables to the customer being late and over budget (Congressional Advisory Panel 2014; Haber, et al. 2013).

### Communication

Haber, et al. (2013) and Congressional Advisory Panel (2014) uncover an organizational culture riddled with communication issues, both external and internal to NNSA. According to Congressional Advisory Panel (2014) findings, NNSA's external communication challenges result from NNSA's lack of effort to disseminate information to national leaders. Subsequently, members of the Executive Branch and Congress find themselves pulling for information. When they finally receive information, it is often "inconsistent from one source to the next" (Congressional Advisory Panel 2014). Consequently, many in Congress question NNSA's credibility.

Further issues the Congressional Advisory Panel (2014) reveals is the tendency for leaders in field operations to circumvent NNSA and DOE headquarters and interact directly with members of Congress. Reports suggest that similar communication behaviors occur within the organization. These reveal instances where headquarters officials circumvent field managers to engage and provide instruction directly to the workforce, often without regard for the effects such acts could have for the program and management discipline (Congressional Advisory Panel 2014). Such behaviors seem to generate friction between program offices, thus impacting the flow of communication. Similarly workforce perception that management withholds information highlights the

need for continuing improvement in both the upward and downward the lines of communication (Haber, et al. 2013). For example, as Haber, et al. (2013) explain, discovery of an individual's new role comes about from the individuals email signature block, rather than from an email NNSA management sends out.

### Trust

The National Research Council's (2012) analysis of NNSA shows an erosion of trust between NNSA and the laboratories. Past failures in safety, security, and business practices at the laboratories, especially Los Alamos, garnered extensive national attention and public criticism. Consequently, NNSA lost trust in the laboratories' ability to maintain safety, security, and fiscal integrity with respect to the mission. The byproduct of the loss of trust is NNSA's exhaustive scrutiny and risk aversion toward the laboratories' operations (National Research Council 2012).

Furthermore, the findings of Haber, et al. (2013) show a lack of trust and respect for NNSA senior leadership by employees across the organization. Many in the workforce do not feel respected or valued for their professional expertise. Similarly, many of the employees express displeasure in having leaders, who do not understand the various functional areas of NNSA's mission instruct and direct them to do tasks (Haber, et al. 2013). Haber, et al. (2013) also point out that many within the organization hold an unfavorable perception of senior leaders due to their lack of engagement with the workforce and for their apparent favoritism.

Risk Management

The Congressional Advisory Panel (2014) study reports that DOE and NNSA do not have a clear mechanism, or a single responsible official to assess and accept risk. This seeming lack of analytical and risk acceptance decision making capability prompts the Defense Nuclear Facilities Safety Board (DNFSB) to exert dominant influence over DOE's risk management programs, thereby making them the de facto regulatory arm. As such, any DNFSB engagement with DOE potentially causes DOE to over react (Congressional Advisory Panel 2014).

***Recommendations***

The lack of a unifying and mission driven culture creates considerable divisions within NNSA (Congressional Advisory Panel 2014). Consequently, the literature suggests the following recommendations to address NNSA's cultural issues:

- *NNSA should configure its oversight of the Laboratories to ensure performance meets the national security priorities within the bounds of budget, policy, and law. However, the Laboratory, personnel, and business operations should be allowed to operate unimpeded by DoE in the conduct of all laboratory operations as a Management and Operations Contractor, within the scope of accepted best business practices. The DoE should provide oversight in an audit capacity, not in a compliance capacity, to minimize unnecessarily intrusive and bureaucratic intervention* (Turpen 2009).

- *NNSA and the laboratories should agree on a set of principles that clearly lay out the boundaries and roles of each management structure, and also that program managers at headquarters, the Site Offices, and in the laboratories be directed to abide by these principles* (National Research Council 2012).

- *Congress should now steer governance back toward a partnership and away from emulating federal operations or a procurement-oriented contract model* (Hecker 2012).

- *Congress should give the NNSA the semi-autonomous status that was envisioned when it was established and isolate it better from partisan politics* (Hecker 2012).

- *The [Energy] Secretary and [NNSA] Director should urgently develop a more robust, integrated DOE & NNSA-wide process to provide accountability* (Congressional Advisory Panel 2014).

- *Senior Leaders need to engage in more direct contact with the staff* (Haber, et al. 2013).

- *The mechanisms for communication going forward must ensure a bottom up communication line that it is not cumbersome, transparent to all, and includes a feedback element* (Haber, et al. 2013).

- *NNSA and each of the laboratories should commit to the goal of rebalancing the managerial and governance relationship to build in a higher level of trust in program execution and laboratory operations in general* (National Research Council 2012).

- *NNSA Senior Leaders need to gain the trust and respect of all employees in its organization. To do this, senior leaders need to carefully consider and then firmly commit to near and long-term actions needed to move away from the perceived "culture of entitlement"* (Haber, et al. 2013).

- *The Secretary should ensure that the Department has strong, technically qualified mission-support staff and should expand that capability if needed in order to make risk-informed decisions in line with mission execution, and to properly consider external oversight and advice (such as that of the DNFSB) during decision making* (Congressional Advisory Panel 2014).

### *Lack of Critical Skills*

Various studies highlight the fact that NNSA faces challenges in sustaining the critical skills necessary to maintain a safe, secure, and effective nuclear enterprise (National Research Council 2015; Congressional Advisory Panel 2014; Government Accountability Office 2012; Hecker 2012; Defense Science Board 2008). In its study, the Defense Science Board (2008) reports of an aging workforce at NNSA and its laboratories. Specifically, the Board illustrates that across NNSA the population of the

workforce that is over forty years old is in the seventy to eighty percent range. Consequently, the pool of eligible retirees and the rate at which they can retire far exceeds the rate at which NNSA is recruiting and hiring new high caliber talent (Defense Science Board 2008). However, the National Research Council in its 2013 report, *The Quality of Science and Engineering at the NNSA National Security Laboratories*, observes that attrition rates at all three national laboratories are low and recruiting efforts to attract highly skilled workers are successful.

Despite this success, the National Research Council (2013) also notes that there is cause for concern at the laboratories, which could impact future recruiting and retention efforts. The Council (2013) cites numerous complaints from workers about deteriorating conditions at the laboratories that impede the performance of experimental work. Some of the conditions noted include: a declining and aging infrastructure, increased burden of rules, regulations, constraints and restrictions; loss of trust, and a culture of audit and risk aversion (National Research Council 2013). Hecker (2012) shares similar concerns about conditions at the laboratories. He remarks that the stifling operating environment at the laboratories makes it cumbersome and expensive to get work done, which makes it difficult to attract young talented scientists and engineers (Hecker 2012). Furthermore, there is a lack of personnel development programs to build and groom the necessary technical and managerial skills at the laboratories and within NNSA. These programs are not only vital to building the necessary skills and experience, but also a culture that will retain and attract highly qualified workers (Congressional Advisory Panel 2014).

In a similar study, the Government Accountability Office (GAO) (2012), comments that the nuclear enterprise site locations and work environments pose

recruiting challenges. Many of the enterprise sites are geographically isolated and do not provide the amenities and opportunities that jobs in more urban areas offer, especially for candidates with spouses who work. Additionally, the work environment at nuclear enterprise sites require the staff to work in secure areas that do not permit the use of personal cell phones, email, and social media. This is potentially disadvantageous in attracting younger skilled workers (Government Accountability Office 2012). Similarly, the critically skilled positions vital to accomplishing the mission require a security clearance and U.S. citizenship. Unfortunately, a large percentage of students graduating from science and engineering programs are foreign nationals (Government Accountability Office 2012). This undoubtedly constrains the pool of possible candidates to select from. The GAO (2012) also indicates that high technology firms in the private sector, that offer attractive benefits and desirable working conditions further constrains the pool of qualified candidates.

### *Recommendations*

A critically skilled staff is vital to NNSA's ability to accomplish its mission. Absent the ability to quickly recruit and retain a critically skilled workforce, NNSA and its laboratories are unable to ensure the safety, security and effectiveness of the nuclear enterprise (Government Accountability Office 2012). Thus, previous studies provide the following recommendations to address the challenge of sustaining a critically skilled workforce:

- *Improve the work environment at the weapons by rebalancing regulatory/operational requirements with mission requirements* (Hecker 2012).

- *Reform the personnel management system, including pay, compensation, and evaluation process to build skills aligned with nuclear security missions* (Congressional Advisory Panel 2014).

- *NNSA should expose early career engineers and scientists to the challenges of weapons design as a means of developing and maintaining a new generation of well-trained weapons designers* (National Research Council 2013).

- *The Administrator [NNSA] should establish and implement a strategy and plans on a priority basis for the next generation of nuclear stewards, identify and implement strategies and tools for recruiting and retaining essential weapons employees, and adopt a comprehensive strategy for knowledge transfer and training that emphasizes the essential contribution of hands-on work* (Defense Science Board 2008).

While the literature reviewed addresses the many cultural challenges facing NNSA, it fails to provide clear and detailed framework for cultural change. Admittedly, the literature provides various recommendations for action. However, many of them appear very general and ambiguous. Furthermore, it is not abundantly clear how many of these challenges continue to permeate NNSA culture. Thus, the aim of this research is to identify and address the cultural challenges of NNSA with the intent to provide a detailed framework for meaningful cultural change. The lens through which this research assesses the organizational culture of NNSA is that of a high reliability organization.

## High Reliability Organization Theory

High reliability organization theory (HROT) provides a framework to analyze the organizational culture of NNSA. HROT is a series of concepts that can help organizations, such as NNSA, understand and focus attention on the mindset and culture necessary for organizational improvement strategies to be effective. An important

distinction to note, however, is that HROT and its concepts should not be viewed as a new methodology for quality improvement, but rather as insights into how to think about and address the challenges an organization faces (Hines, et al. 2008).

The premise of HROT is the characterization of organizations as highly reliable. Organizations characterized as highly reliable have a number of similarities. First, they operate in hazardous industries, to include operating in unforgiving political and social environments (Weick, Sutcliffe and Obstfeld 2008, Werner 2012). Second, the possible consequences from errors or mistakes could cause catastrophic harm and precludes learning from experimentation. Third, their technologies are risky and allow for the inevitability of error. Finally, to avoid errors, these organizations adopt complex processes that are tightly coupled to interconnected technologies and resource demands. This concept of complexity and tight coupling increases overall reliability by "motivating designers to create more redundancy in a system, inspiring operators to customize centralized decision premises, favoring the development of multiple theories of system functioning, and encouraging learning and discouraging complacency" (Weick, Sutcliffe and Obstfeld 2008).

Organizations display many of the above characteristics, but that does not necessarily characterize them as highly reliable organizations. Defining what constitutes a high reliability organization presents some challenges and is a point of argument among theorists. Theorist, Karlene Roberts (1990), initially proposed that high reliability organizations are a subset of hazardous organizations that have operated relatively error free for a lengthy period of time. Specifically she asserts that:

> "To identify these organizations as "highly reliability" organizations one must ask the question, "how often could this organization have failed with dramatic consequences?" If the answer is many thousands of times, the organization is highly reliable" (Roberts 1990).

Other theorists, such as Weick, Sutcliffe, and Obstfeld (2008) argue that the notion of organizational reliability being achieved through repeatability of actions or patterns of activity fails to address the fact that reliable systems must operate the same way even though the working environment fluctuates and is sometimes unknown. Consequently, more recent definitions of high reliability organizations emphasize the dynamic nature of achieving reliability. Specifically, these definitions focus on the idea that high reliability organizations seek to improve reliability by taking action toward both the prevention of errors and the quick recovery should errors take place. Theorist Gene Rochlin (1993) supports the notion that reliability-seeking organizations are not characterized by their absolute errors or accident rate, rather by their "effective management of innately risky technologies through organizational control of both hazard and probability."

A prevailing concept that heavily influences high reliability organization theory is Weick, Sutcliffe, and Obstfeld's (2008) five characteristics of mindfulness. The literature suggests these characteristics are necessary processes commonly associated with successful and effective high reliability organizations. The mindful approach of these processes forms the basis of how individuals within an organization think about issues and evaluate the environment. In essence, mindful organizing provides the capability to discover and manage unexpected events (Weick, Sutcliffe and Obstfeld 2008). Figure 6 illustrates the relationships between the five characteristics of mindfulness and the end

goal of reliability. "Without a constant state of mindfulness, an organization cannot create or sustain highly reliable systems" (Hines, et al. 2008).

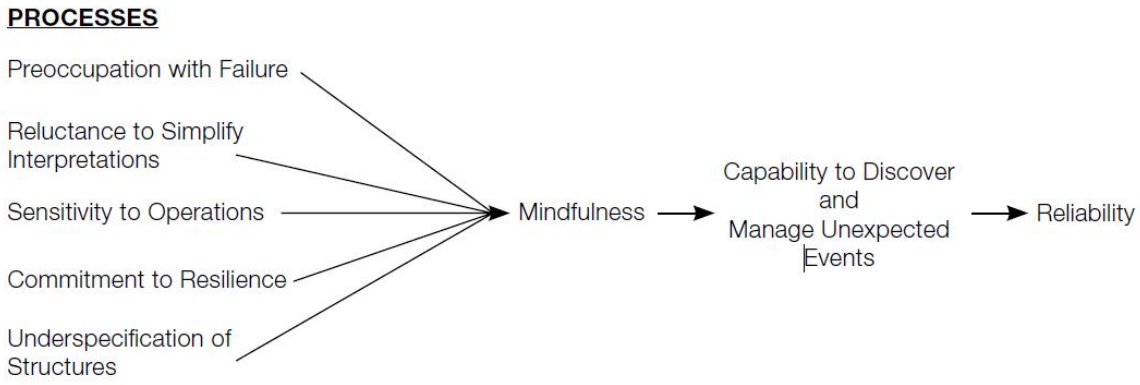



**Figure 6. A Mindful Infrastructure for High Reliability**

### *Preoccupation with Failure*

High reliability organizations (HRO) focus on predicting and eliminating errors and crises rather than reacting to them. By focusing on failure rather than success, organizations acknowledge the fallible and dangerous nature of their operations. Consequently, they seek out error in an effort to eliminate it (Weick, Sutcliffe and Obstfeld 2008). Similarly, effective HROs view "near failure" as opportunities to improve current systems by "examining strengths, determining weaknesses, and devoting resources to improve and address them" (Hines, et al. 2008). Moreover, HROs do not view near misses as evidence that the system has adequate safety measures to guard against errors because such an approach fosters complacency rather than reliability. Instead, HROs interpret near misses as data points for learning toward the application of improved future processes (Hines, et al. 2008).

### *Reluctance to Simplify Interpretations*

To combat the complexity of tasks, organizations generally look for ways to simplify their processes. While simplification works to streamline processes, it also allows organizations to ignore data. Simplification in HROs is dangerous because it "limits the precautions people take and the number of undesired consequences they envision" (Hines, et al. 2008). Furthermore, simplifying processes allow anomalies to collect, intuitions to go unheeded and undesired consequences to swell; thereby increasing the likelihood of a surprise event (Weick, Sutcliffe and Obstfeld 2008). Consequently, HROs constrain their simplifications and refuse to ignore the explanations for difficulties and problems that they face. Instead, these organizations acknowledge their work is complex and do not seek or accept simplistic solutions to complex problems (Hines, et al. 2008, Weick, Sutcliffe and Obstfeld 2008). Thus, what makes HROs distinct from other organizations is they make fewer assumptions and train their people to have greater awareness (Weick, Sutcliffe and Obstfeld 2008).

In their reluctance to simplify, HROs often introduce redundancy into the system; meaning there is duplication and back-ups. Redundancy often elicits skepticism, which could counteract potential complacency in the system. Moreover, redundancy serves as cross-checks that question the sufficiency and competency of safety measures (Weick, Sutcliffe and Obstfeld 2008). For example, when a report, process, or procedure is met with skepticism, generally two individuals provide a review- the skeptic and another person. This duplicate effort serves to increase greater awareness and reduce the number of undesired consequences.

### *Sensitivity to Operations*

It is important to be cognizant of how processes and systems affect an organization. Effective HROs understand and are mindful of the complexity of the system in which they work (Hines, et al. 2008). In these organizations, each employee is mindful of operations and works to identify system anomalies in an effort to prevent undesired consequences. Maintaining "situational awareness" and sensitivity to operations is critical for staff at all levels because it is the only way to identify and address system anomalies and errors (Hines, et al. 2008). Conversely, the loss of sensitivity carries inherent dangers known as "automation surprises." Weick, Sutcliffe, and Obstfeld (2008) illustrate the problems of automation surprises using the example of an aircraft with automated cockpits. They explain these surprises in the following manner:

> "These surprises occur when pilots command the aircraft to do one thing and it does something else because the on-board computers are integrating a different set of inputs in a different way. When this happens, the crew finds itself in the unfamiliar position of asking "now what is it doing? what will it do next?" and losing valuable time and separation among aircraft while seeking an answer" (Weick, Sutcliffe and Obstfeld 2008).

Sensitivity to operations and situational awareness, therefore, reduce the incidence of automation surprises and provide for the expeditious identification and correction of errors before the consequences swell (Hines, et al. 2008, Weick, Sutcliffe and Obstfeld 2008).

### *Commitment to Resilience*

Surprises happen despite organizational efforts to predict and eliminate them, thus what matters is how the organization reacts when surprises occur. Organizations face the reality of fallible humans and less than perfect technology; HROs are no exception. HROs acknowledge this reality and develop both anticipation and resilience initiatives to cope with it. Anticipation in this sense refers to the "prediction and prevention of potential dangers before damage is done," whereas resilience denotes the "capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back" (Wildavsky 1991). While HROs generally seek to anticipate possible system failures, they also develop aptitudes for resilience. Weick, Sutcliffe, and Obstfeld (2008) explain that resilience is not simply bouncing back from errors, but also coping with surprises as they arise. Additionally, the nexus of resiliency is to utilize the lessons learned from the errors. The most effective HROs do not wait for failures to occur before addressing them (Weick, Sutcliffe and Obstfeld 2008). Rather, they prepare for these failures by applying the lessons learned to train the organization to perform quick situational assessments, work together as a team, and practice responses to system failures (Hines, et al. 2008).

### *Underspecification of Structures (Deference to Expertise)*

In order to cultivate a culture of high reliability, organizational leaders must defer to those individuals who have the most knowledge relevant to the task at hand. Those highest in the organizational hierarchy do not necessarily possess the information essential to addressing the situation at hand (Hines, et al. 2008). Therefore, it is essential

that those with the critical information provide their input. However, "the worst thing a leader can say when someone provides input is, 'I already know that'" (Gamble 2013). In these situations, individuals refrain from sharing information all together. Conversely, successful HROs foster a culture where employees at all levels are comfortable sharing information with others (Hines, et al. 2008). Thus, deference to expertise is necessary for organizations to mindfully discover and manage unexpected events.

**Summary**

To lay the foundation for this research, this chapter reviewed various bodies of literature chronicling the enduring organizational cultural challenges facing the Department of Energy's nuclear enterprise. Many of these challenges have plagued DOE since its acquisition of the nuclear weapons mission from the Atomic Energy Commission in the 1970s. While the literature provides recommended courses of action to address many of these challenges, many of the recommendations are generic, ambiguous, and fail to provide a clear and detailed approach to cultural change. Furthermore, it is not clear how many of these issues continue to permeate the culture. Thus, this research attempts to identify and explore the organizational cultural challenges within the nuclear enterprise in greater detail in an effort to provide a framework for meaningful organizational change. A theoretical perspective that may be useful in examining the organizational culture is the notion that DOE/NNSA is a high reliability organization. The next chapter discusses the research further by introducing the methodology this research uses to analyze NNSA's organizational culture.

# III. Methodology

## Overview

To identify and understand NNSA's organizational cultural challenges and their impact on the effectiveness of the nuclear deterrent mission, this research employs the case study research method. Through a case study, this research seeks to obtain data and insights on the effectiveness of the current organizational structure of NNSA using multiple collection methods. First, this case study conducts an analysis of the existing literature on the organizational culture of NNSA. Second, this study applies observatory insights from site visits to various agencies within NNSA. Third, and primary data collection method consists of focused interviews of middle management level employees across the organization designed to obtain their perspective on the characteristics of NNSA's organizational culture. The case study for this research is primarily exploratory in nature and employs the strategy of triangulation to identify and understand converging patterns in the data in an effort to create a framework for the long-term effectiveness of the nuclear enterprise (Leedy and Ormrod 2013; Yin 2009).

Yin (2009) discusses three criteria to consider in determining the appropriate research method to use. These criteria are 1) the type of research question posed, 2) the extent of control an investigator has over actual behavioral events, and 3) the degree of focus on contemporary opposed to historical events. Taking these criteria into consideration, the case study methodology is appropriate for this research for a number of reasons. First, since the questions this research poses are "how" and "why" questions, an exploratory case study are suitable (Yin 2009). Second, the conduct of this research does not require the investigator control of behavioral events. Third, since this research

focuses on contemporary events that influence the organizational culture of NNSA, the case study is the preferential method (Yin 2009).

## Research Design

Research design is a plan that guides the collection, analysis, and interpretations of data in order to address a research problem (Leedy and Ormrod 2013). Yin (2009) illustrates five components that are important in case study research: 1) a study's questions, 2) its propositions (if any), 3) its unit(s) of analysis, 4) the logic linking the data to the propositions (data collection design), and 5) the criteria for interpreting the findings. Subsequent paragraphs discuss these components and their role in this research.

### *Research Questions*

"A research design is the logic that links the data to be collected (and the conclusions to be drawn) to the initial questions of a study" (Ogden 2003). Therefore the initial step in research design is to develop questions the research seeks to answer. Yin (2009) suggests three helpful to hints to develop research questions. First, utilize the literature to narrow the scope of the topic. Second, examine some key studies in the topic of interest looking for "loose ends for future research." Third, reviewing additional studies on the topic might provide support for the research questions or suggest ways to sharpen them (Yin 2009). A thorough literature review provides the context to address the following research questions on the organizational culture of DOE/NNSA:

1. What role does DOE play in the nuclear enterprise?

2. How is DOE organized?
3. What current organizational cultural challenges does DOE face?
4. What opportunities exist for enduring cultural change?
5. What are the barriers to cultural change?
6. What are the benefits of cultural change to the long-term effectiveness of the nuclear enterprise?

### *Propositions*

Yin (2009) explains that propositions "direct attention to something that should be examined within the scope of a study." He explains further that although the "how" and "why" questions describe what one finds interesting to answer, they do not detail what a researcher should study (Yin 2009). Developing and stating propositions helps direct the researcher to what he or she should study (Yin 2009).

However, not all studies have propositions. Such is the case with studies with research methods that are exploratory in nature. Nevertheless, "every exploration should still have some purpose. Instead of propositions, the design for an exploratory study should state this purpose, as well as the criteria by which an exploration will be judged successful" (Yin 2009). Given this thought process, the purpose of this research is to determine the long-term effectiveness of the nuclear enterprise, given the current organizational culture of NNSA. The criterion to measure the success of this research is the degree to which the organizational culture of NNSA exemplifies the following characteristics of high reliability organizations:

- Preoccupation with failure
- Reluctance to simplify interpretations
- Sensitivity to operations
- Commitment to resilience
- Deference to expertise

### *Unit of Analysis*

Before any research commences with data collection, it is important to define what the unit of analysis is. "As a general guide, your tentative definition of the unit of analysis is related to the way you defined your initial research questions" (Yin 2009). In essence the unit of analysis influences the data the researcher collects and from whom or where he or she gathers it (Ogden 2003). The unit of analysis for this research is the organizational culture of NNSA.

### *Data Collection Design*

The next step in the research design process is to determine what data to collect and the means to collect the data (Ogden 2003). A significant part of data collection is to consider whether the research conducts a single case study or multiple case studies and whether each case consists of one respondent or multiple (Ogden 2003). Yin (2009) discusses the advantages and disadvantages of multiple case studies versus single case studies and when each is appropriate to use. Multiple case studies are most appropriate when each case can be considered a unique experiment. Furthermore, the data obtained from multiple case studies is generally more compelling than from a single case. Yin (2009) states that, "six to ten cases in the aggregate would provide compelling support for the initial set of propositions" (p.54). Conversely, single case studies best address cases

that are unusual, critical, and revelatory (Yin 2009). Since NNSA's organizational culture comprises eight sub-organizational cultures, each sub-organization culture can be considered a unique experiment. Thus, the most appropriate case study method for this research to use is multiple case studies.

Additionally, this research seeks to obtain data and insights on the effectiveness of the current organizational structure of NNSA using multiple collection methods. First, this case study conducts an analysis of the existing literature on the organizational culture of NNSA, to include previous reports, reviews, and policy and guidance documents. Second, this study applies observatory insights from site visits to various agencies within NNSA. Third, and primary data collection method consists of focused interviews of middle management level employees across the organization in an effort to obtain their perspective on the characteristics of NNSA's organizational culture. The benefit of using multiple collection methods is to ensure construct validity in the research. Additionally, an advantage of using multiple collection methods is to identify information that converges on the same set of facts using a strategy known as triangulation (Yin 2009). "The triangulation made possible by multiple data collection methods provides stronger substantiation of constructs and hypotheses" (Ogden 2003). Similarly, multiple respondents provide another avenue to obtain multiple sources of data. Ogden (2003) notes two key advantages to using multiple respondents: 1)" they enhance the creative potential of the study, and 2) the convergence of observations from multiple investigators enhances confidence in their findings." The primary data collection method of this research is focused interviews of multiple respondents. Subsequent paragraphs discuss

the details of the selection method of the respondents and the number of respondents this research interviews.

### Focused Interview Development

A significant source of information for case study research is the interview. Unlike surveys, "interviews are guided conversations rather than structured queries" (Yin 2009). Two important tasks to be mindful of when conducting interviews are 1) maintain the line of inquiry dictated by case study protocol, and 2) ask unbiased questions that serve the needs of the line of inquiry (Yin 2009).

Yin (2009) discusses some of the advantages and disadvantages of conducting interviews. The benefits of interviews as a data collection are they allow the researcher to focus directly on specific case study topics and they provide insights that enable the researcher to draw inferences and explanations of phenomena (Yin 2009). Conversely, interviews are highly susceptible to bias due to poorly articulated questions, or bias responses from the respondent(s). Furthermore, the data collected using this method could contain recallability and reflexivity errors. An important aspect of research design is to collect data that is as accurate and unbiased as possible (Yin 2009). However, with interviews, the accuracy is chiefly dependent upon the researcher's ability to accurately recall and document data. Moreover, interview respondents can often affect the accuracy of the data by providing answers that he or she thinks the interviewer wants to hear (Yin 2009).

There are many types of case study interviews. The type this research employs is the focused interview. With this type of interview the duration of the interview is

normally short- about an hour. Additionally, focused interviews may consist of opened ended conversation, but usually follows a standard set of questions derived from the case study protocol (Yin 2009).

The conduct of interviews comes in various forms and has various advantages. Face-to-face interviews, for instance, carry a distinct advantage in forming a rapport with the individual(s) being interviewed. These interviews also yield the highest response rates (Leedy and Ormrod 2013). Conversely, telephone interviews provide the researcher with convenient access to individuals virtually worldwide, and these interviews are less time consuming and cheaper than traveling to a destination to conduct a face-to-face. However, the response rate of a telephone interview is significantly less than a face-to-face interview (Leedy and Ormrod 2013).

### *Design*

This research employs focused interviews to collect data on the organizational culture of NNSA using a semi-structured interview guide (See Appendix D). The guide consists of three pages in all. The first page is an informational document providing interview respondents with 1) the purpose of the interview, 2) participation statements, and 3) a confidentiality statement. The interview gathers basic demographic information, such as name, job title, years with the organization, and years in current position. This research gathers this information for the purpose of ensuring the respondents meet the requisite interview criteria. The subsequent section on participant selection discusses the interview criteria in further detail. The demographic information, however, does not factor into the analysis of the information. This research analyzes all response and

information in aggregate. The remaining two pages consist of the actual interview questions. Six different sections of questions make up the structure of the interview. Each section of questions seeks to obtain information pertaining to the organizational culture of NNSA. The overarching objective of the questions is to characterize the effectiveness of the nuclear enterprise, given NNSA's current organizational culture.

### *Participant Selection and Interview Conduct*

This research consists of multiple case studies, which employs focused interviews targeting personnel within NNSA. The interview criteria this research establishes are the following: 1) six or more years of experience at NNSA, 2) serving in mid-level management position, and 3) accessible for interviews. The aim of this research is to target suitable personnel at the following agencies within NNSA:

- NNSA Headquarters
- National Laboratories
    - Sandia
    - Lawrence Livermore
    - Los Alamos
- Nuclear Weapons Production Facilities
    - Pantex
    - Y-12
    - National Security Campus at Kansas City
    - Savannah River

For the purpose of this research, each of the above organizations formulates a single case. Therefore, the design of this research is to examine the organizational cultures of the eight organizations, in order to identify and understand the effectiveness of the current organizational structure of NNSA. To aid in identifying suitable participants, a contact within NNSA provided a list of personnel meeting the requisite criteria.

Once in possession of the list of suitable participants, solicitations went out to the organizations via email and phone calls. The inquiry initially elicited seven positive responses. The others either did not respond or declined to participate. However, out of the seven who responded positively, only five willingly participated. After initial contact, all further attempts to gain contact failed. Thus the pool of willing participants was smaller than expected. "This finding further supports the decision to conduct case study research rather than using a quantitative survey methodology" (Ogden 2003).

With the pool of willing participants confirmed, the researcher conducted interviews from July 2016 to August 2016. The targeted duration for each interview was one hour.

### *Data Analysis*

The final step of research design is to analyze the data and determine which analytic strategy to use to interpret the data (Yin 2009). "In the data analysis phase, the ultimate goal is to treat the evidence fairly, to produce compelling analytic conclusions, and to rule out alternative interpretations" (Ogden 2003). One method of analysis is to categorize and interpret the data in terms of common themes. Categorizing the data into

themes allows the researcher to synthesize the data to develop an overall picture of the case (Leedy and Ormrod 2013).

The basis of this analysis is to identify common themes from the responses given during each interview session. Using these themes, the researcher seeks to distinguish similarities and differences among the data garnered from the interviews. Once the researcher identifies the similarities and differences among the data, he compares the findings with data from existing literature and site visits, in an effort to establish subject matter congruence that yields greater insight into and understanding of the cultural strengths and challenges within NNSA. This research presents the results of the data analysis using various tables and charts. Chapter 4 discusses these tables and charts and the data they present.

## Institutional Approval

The Air Force Institute of Technology (AFIT) granted an Institutional Review Board (IRB) exemption for this study on 8 July 2016. Appendix C contains a copy of the exemption letter.

## Summary

This chapter outlines the basis for selecting case study as the research methodology and the components of research design. This research seeks to obtain data and insights on the effectiveness of the current organizational structure of NNSA using multiple collection methods. First, this case study conducts an analysis of the existing literature on the organizational culture of NNSA. Second, this study applies observatory

insights from site visits to various agencies within NNSA. Third, and primary data collection method consists of focused interviews of middle management level employees across the organization designed to obtain their perspective on the characteristics of NNSA's organizational culture. This research presents the data from the multiple sources using various charts and graphs. Chapter 4 presents the analysis and answers the investigative questions of the research.

# IV. Analysis and Results

## Chapter Overview

This chapter presents the analysis and results of the data collected by this research. As the previous chapter outlined, this research utilized three methods of data collection: 1) a review and content analysis of existing literature on the organizational culture of NNSA, 2) observatory insights from site visits to various agencies within NNSA, and 3) focused interviews of middle management level employees across the organization; with the aim of identifying and understanding NNSA's organizational cultural challenges and their impact on the effectiveness of the nuclear deterrent mission. This chapter begins with a description of the data collected, followed by a discussion of the data analysis as it relates to the investigative questions of this research.

## Data Collected

This research began the first means of data collection with a thorough review of the existing literature on the organization of NNSA. Among the literature used to gather data, the researcher reviewed historical documents, recent studies and reports, and current policy and planning documents, in an effort to provide the foundational understanding of the organization and culture challenges of DOE and NNSA. During the review process, the researcher conducted a content analysis of the data in order to identify prevalent themes. The data collected provides the primary information to address investigative questions one and two. The data also provides a foundational basis from which to compare and validate the data collected from site visits and focused interviews.

Data and insights gathered from visits to various NNSA agencies and sites provide the second means of data collection. Data collected during site visits ran concurrently with the review of recent literature and focused interviews, and provide another point of intersection in the data to foster understanding and validity.

Focused interviews of mid-level managers within NNSA form the bulk of the data for this research and provide the majority of information to address investigative questions three through six. The conduct of the interviews spanned the time period of July 2016 to August 2016. The researcher afforded those interviewed anonymity in their responses. Therefore, this research identifies or cites no names or specific organizations. In an effort to maintain a balanced data collection approach, the researcher solicited the help of a contact within NNSA to identify and provide a list of personnel within the case study organizations who met the criteria of mid-level manager. The resulting list included the contact information for individuals within each organization that met the criteria. Solicitations went out to these organizations via email and phone calls. Out of those contacted, seven responded positively; the others either did not respond or declined to participate. However, out of the seven who responded positively, only five willingly participated. The next section of this chapter discusses the analysis and findings from these interviews as they relate to the research's investigative questions.

## Results and Investigative Questions Answered

### *Investigative Question 1*

The initial question asked during the conduct of this research was about the role DOE plays in the nuclear enterprise. The literature review outlines the history of DOE

and how DOE inherited the nuclear weapons mission from the Atomic Energy Commission, as part of the effort to control and foster the peacetime development of military and civil applications of nuclear energy and science and to "keep nuclear weapons out of the hands of the military" (Buck 1983; Defense Science Board 2006; Fehner and Hall 1994). Also highlighted in the literature review is the incongruent nature of DOE's missions, policies and management methods in meeting the needs of the nuclear enterprise. The data gathered indicates DOE applied a micromanagement approach that greatly hindered the effectiveness of the weapons program.

### *Investigative Question 2*

To lay the foundation for this research, the second question addresses the organization of DOE. The literature review highlighted that DOE is a conglomerate of agencies and mission sets. The nuclear weapons mission represents a small portion of what DOE oversees; the primary responsibilities for which were transferred to NNSA due to DOE's management methods impeding the effectiveness of the nuclear weapons program. However, as the literature review illustrates, NNSA with its three national laboratories, four production facilities, and single test site, has a storied history of organizational cultural challenges, most notably a lack of national leadership consensus, lack of mission driven culture, and sustaining critical skills. These challenges form the basis for the data collected in the focused interviews to address the remaining investigative questions.

### *Investigative Question 3*

The third question inquired about the current organizational cultural challenges facing DOE. This research addresses this question using two approaches. First, the researcher asked the case study respondents to identify two to three key issues challenging the organization. Second, the researcher asked the case study respondents questions pertaining to the following challenges highlighted in the literature review: accountability, communication, and risk, in order to draw a comparison between what the literature reported and current organizational conditions. The following paragraphs discuss the findings from each approach in greater detail.

In an effort to identify what current organizational challenges DOE/NNSA are facing, the researcher asked each respondent to identify two to three key issues challenging the organization. While there is variability in the answers received from each respondent, a few prevalent themes surfaced. Table 2 summarizes the various challenges highlighted by the case study respondents. The subsequent paragraphs discuss each of the challenges in greater detail.

**Table 2. Key Organizational Challenges**

| | Respondent | | | | |
|---|---|---|---|---|---|
| **Challenge** | **A** | **B** | **C** | **D** | **E** |
| Resource Constraints | X | X | X | X | X |
| Political Uncertainty | | X | X | | |
| Contract Renegotiation | X | | X | | X |

Resource Constraints

Resource constraints appear to be the most prevalent organizational challenge facing NNSA. A consensus among all case study respondents is that there are not enough

resources to accomplish everything that needs to be done to maintain a safe, secure, and effective nuclear enterprise. NNSA is poorly resourced in both manpower and money. This presents a significant challenge in completing work on time and on budget. One respondent explains the resource alignment issues that result from resource constraints by saying:

> *"I have seven people working for me that manage an $80 billion program, whereas other areas are allocated 80 people to manage a $1.2 billion program."*

A much needed release valve on resource constraints is needed for continued enterprise success. In fact, a few billion dollars per year could fix these problems. However, pressure from congressional oversight hampers NNSA's ability to be flexible, adaptable, and responsive to resource issues.

### Political Uncertainty

While not a seemingly major organizational challenge within NNSA, two respondents highlighted the pending turnover of the presidential administration and the resultant uncertainty as a significant area of concern. The primary challenge in an uncertain political environment is that guidance is often wishy washy. Consequently many programs are either underfunded or shortcuts are taken to save money. Therefore, as one respondent remarked:

> *"The nation needs to make a decision on the direction it wants to go."*

National senior leader consensus on guidance is imperative to the enduring success of the nuclear enterprise. However, with the White House pushing for a world free of nuclear

weapons, in the waning months of the administration, the future role of the nuclear enterprise remains uncertain.

### Contract Renegotiation

A third challenge, as reported by respondents A, C, and E, is contract renegotiation. The current infrastructure of the national laboratories and nuclear enterprise production facilities operates under a government owned and contractor operated (GOCO) model (Buck 1983). Private sector organizations operate the laboratories and production facilities under sponsoring agreements called management and operating (M&O) contracts. The fundamental purpose of the M&O contract is to attract the nation's top scientific and engineering talent in order to address the enduring scientific and technical national security challenges that could not be achieved using existing government or contractor resources (Hruby, et al. 2011). However, approximately every five years, the contract expires and enters the re-bidding process (U.S. Department of Energy 2016). The uncertainty within the process, however, presents a myriad of challenges for the organization. As one respondent commented:

> *"The contract re-bidding process causes consternation for following reasons: potential loss of benefits or change of benefits; reduction in workforce; and it may make it harder to recruit and maintain people in the nuclear business."*

Stabile and consistent operations are necessary for the long-term effectiveness of the nuclear enterprise. However, with contracts expiring every five years the long-term credibility of the nuclear deterrent is in doubt.

The literature review highlighted many organizational cultural challenges facing NNSA, to include accountability, communication, and risk. However, it is not

abundantly clear how many or if all of them continue to permeate NNSA organizational culture. Therefore, to determine if this is the case, the researcher asked the case study respondents questions pertaining to accountability, communication, morale, and risk within NNSA organization. The intent of this analysis is to draw a comparison between what the literature reported and current organizational conditions. The subsequent paragraphs discuss the results of this analysis in detail.

### Accountability

The analysis of the data on accountability occurred in two phases. In phase one; the researcher conducted a content analysis of the recent literature that addressed the challenge of accountability. During the content analysis, the researcher noted what each body of literature had to say about the level of accountability within NNSA. The researcher then classified those responses into the following five categories:

Excellent
Good
Satisfactory
Fair
Poor

For the purposes if this analysis, each body of literature that discussed the level of accountability in NNSA counted as a single response. Similarly, in phase two, the researcher compiled and classified the responses of each case study respondent into the same five categories. Figure 7 depicts the categorization results from each phase.

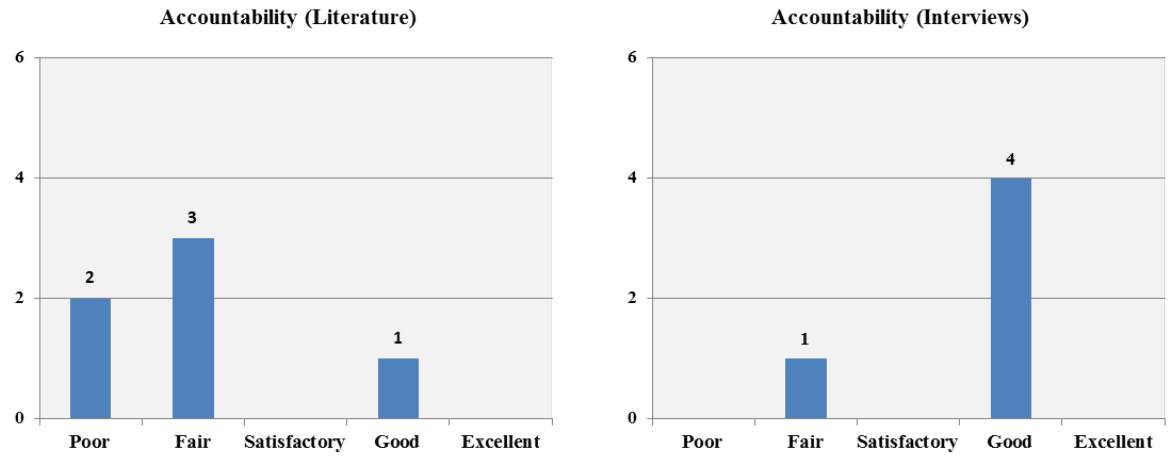



**Figure 7. Level of Accountability in NNSA**

When it comes to assessing the level at which personnel are held accountable in NNSA, there is a clear disparity in the data. Majority of the literature reviewed rated the level of accountability from the NNSA senior staff level down to the entry level worker to be poor or fair, citing that:

> *"Poor performers are not held accountable and blurred ownership and accountability for the nuclear mission often result in deliverables to the customer being late and over budget"* (Congressional Advisory Panel 2014; Haber, et al. 2013).

In contrast, the majority of the case study respondents valued the level of accountability as good. Those respondents rating accountability as good explain that individuals are held accountable through quarterly and annual performance evaluation reports. As one respondent commented:

> *"Employees are held accountable through a management review process, where every quarter every project is reviewed to ensure it measures up to standards."*

While the exact cause of disparity in data is unknown, there are numerous possible explanations. For instance, the sample size for this research may be too small

and not entirely representative of the organization as a whole. On the other hand, many of the literature documents reviewed are a number of years old and therefore do not contain current data. Whatever the case may be, the data, as depicted, suggests that the level of accountability within NNSA is improving from the level assessed by recent literature.

### Communication

Similar to analysis of the data on accountability, the researcher analyzed the data on communication within NNSA in two phases. In phase one; the researcher conducted a content analysis of the recent literature that addressed the flow of communication within NNSA. During the content analysis, the researcher noted what each body of literature had to say about the flow of communication and classified those responses into the following five categories:

Excellent
Good
Satisfactory
Fair
Poor

As with the analysis of the accountability data, each body of literature that discussed the flow of communication in NNSA counted as a single response. Similarly, in phase two, the researcher compiled and classified the responses of each case study respondent into the same five categories. However, included with the responses from the case study respondents is the categorization of data gathered from site visits. For the purposes of this analysis, the observations made during site visits count as one response, even if the researcher noticed the same phenomenon during multiple site visits. The researcher

grouped the site visit observations and case study interview responses together under the label of "experiential." Figure 8 depicts the categorization results from each phase.

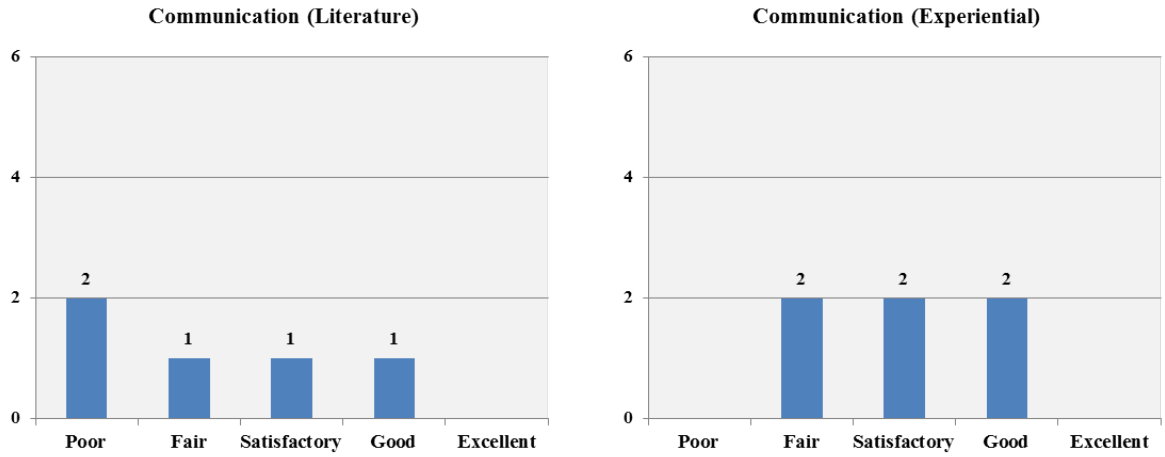



**Figure 8. Flow of Communication in NNSA**

Overall there appears to be a moderate shift in the quality of communication flow within NNSA. As indicated by the responses, the data collected through experiential means is not a significant departure from the data collected during the literature review. A probable reason for this is better top-down communication within the NNSA organization. One piece of literature documenting poor communication flow cites evidence of "poor communications and lack of transparency at the highest levels" (National Research Council 2012). Although not perfect, the aggregate responses from each case study respondent indicate improvement in the flow of information from the higher levels in the organization down. As one respondent explained:

> *"The mission priorities are communicated down through the federal program managers."*

Observations made during site visits support the notion of communication flow improvement. During various site visits to NNSA facilities, the researcher observed

various forms of media employed to convey information to the workforce, to include mission statements and safety messages. Despite these improvements, many of the respondents indicated areas of continued challenge. For instance, a couple of the respondents stated that most communication is still stove piped and there is not a lot of cross organization communication. While communication challenges continue to permeate NNSA's organizational culture, the data seems to indicate that the flow of communication within the organization is improving.

### Risk

This research asked case study participants to describe the overall culture of NNSA in terms of risk. The researcher compiled and classified the responses from each case study respondent into the following five categories:

Extreme Risk Acceptance
Some Risk Acceptance
Neutral
Somewhat Risk Averse
Very Risk Averse

Additionally, the researcher conducted a content analysis of recent literature to identify similar descriptions of NNSA culture. During the content analysis, the researcher classified the data collected into the same five categories listed above. Figure 9 provides a breakout of the responses from the case study participants and the data collected from a content analysis of recent literature.

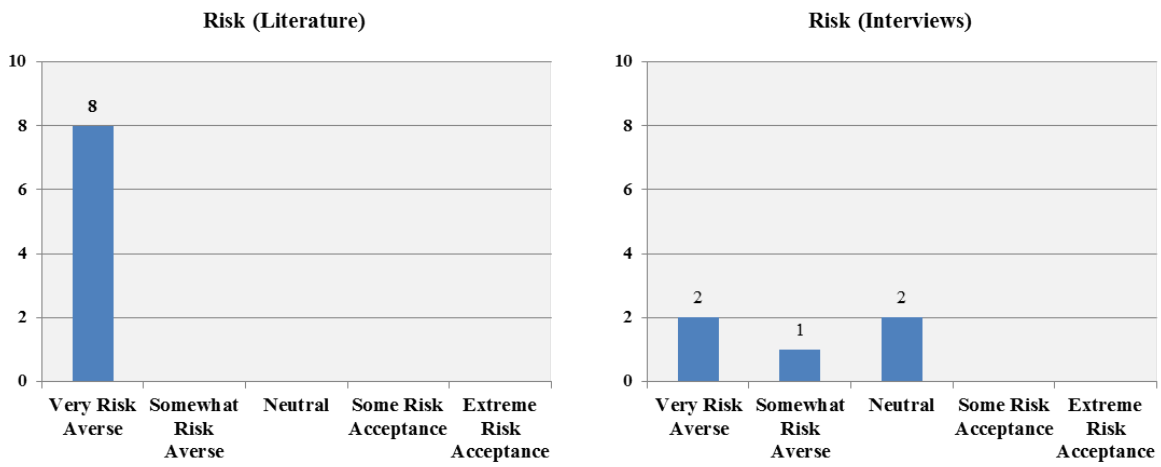



**Figure 9. NNSA's Risk Culture**

Looking at the data, it is interesting to note the significant variance in the data collected from recent literature and that collected from each case study respondent. All the data sources in the literature review classified the culture of NNSA as very risk averse. Whereas, only two out of five case study respondents rated NNSA's culture risk averse. An initial interpretation seems to indicate a shift in NNSA's culture away from being very risk averse to more neutral levels of risk acceptance. The following comment by one respondent seems to support this notion:

> *"On a scale of 1 to 10 with 1 being non-compliant and 10 being compliant and a 7 equaling success, NNSA is currently at a 4. Two to three years ago, the organization was at a 2 when it comes to risk aversion."*

Interestingly, just as many case study respondents classified NNSA's culture as very risk averse as did neutral; with one respondent rating the culture as somewhat risk averse. While this does not necessarily mean that NNSA's culture is not shifting away from risk aversion, it simply suggests that the shift is sluggish and there are still areas of concern, as one respondent commented:

*"The bureaucracy and oversight from NNSA is not helpful. The workforce feels micromanaged by NNSA."*

While risk aversion continues to infiltrate NNSA culture, it seems that the organization is starting to move toward more neutral territory; albeit at a sluggish rate.

### *Investigative Question 4*

Investigative question 4 seeks to identify opportunities for enduring cultural change. To determine the cultural change opportunities within NNSA, the researcher asked the case study respondents about recommended courses of action to address the challenges facing the organization both in the near and long term. Table 3 provides a summary of their responses.

**Table 3. Opportunities for Cultural Change**

| | | Respondent | | | | |
|---|---|---|---|---|---|---|
| **Opportunities** | | **A** | **B** | **C** | **D** | **E** |
| Accountability | | | | | | |
| | Better M&O contract strategy | | X | | | X |
| Communication | | | | | | |
| | Foster trust-based relationships | X | X | | X | X |
| | Connect mission with work being done | | | X | X | |
| Risk Management | | | | | | |
| | Define clear roles and authority | | X | X | X | X |
| Attracting and Retaining Highly Skilled Personnel | | | | | | |
| | Better pay and compensation | X | | X | X | |
| | Get individuals invested early | X | X | | X | X |

The researcher gathered some interesting initial observations from the designated responses. First, it seems that fostering trust-based relationships, defining clear roles and authority, and getting individuals invested early are the most valued opportunities for cultural change. Second, it appears that work experience and how each respondent

identifies with his or her agency within NNSA influenced their responses. For instance, respondents B and E each work at similar agencies and both highlighted better M&O contract strategy as an opportunity for cultural change. Similarly, respondents C and D share similar years of work experience (between 6 to 10 years) and each emphasized connecting the mission with work performed as an opportunity for cultural change; suggesting a potential keener sensitivity to the workforce's need to feel connected to mission goals. Overall, the respondents had diverse views on cultural change opportunities. However, in many areas the respondents reached a majority consensus on what to address. Subsequent paragraphs discuss these opportunities in greater detail.

### Communication

Communication is an important ingredient in an organization. It is the process by which things get done. Good and effective communication not only conveys mission objectives, plans, and task, but it also builds teamwork and fosters trust (Gibson, et al. 2012). The opposite is also true. Absent effective communication, there is confusion, delay, and lack of team harmony and trust. A body of literature in the literature review describes the eroding nature of poor communication within NNSA in this manner:

> *"There is a lack of trust and respect for NNSA senior leadership by many employees across the organization. Individuals described not feeling valued or respected for their professional expertise and being instructed about what to do by leaders who generally do not understand the various functions that NNSA is responsible for. A lack of engagement by senior leadership of the staff combined with the perception of favoritism for a small group, contributes to the unfavorable perception held by many of the senior leadership team"* (Haber, et al. 2013).

Investigative question 3 also addressed the on-going communication challenges within NNSA. Thus when asked about recommended courses of action to address the challenge, the respondents provided a near unanimous response to foster trust-based relationships.

### *Foster Trust-Based Relationships*

While communication from the senior leader level down to the work force seems to be improving, four out of the five respondents acknowledged that fostering trust-based relationships remains an area of opportunity for improvement. One respondent commented:

> *"There is not a lot of information sharing within NNSA. Many people within the organization are afraid their funding for programs will be cut if they share their ideas and another agency within NNSA takes that idea and makes it better."*

As a corrective measure, two respondents recommended the best approach to fostering trust among the workforce is to manage by walking around. This is especially effective with senior level leaders. As one respondent remarked:

> *"More engagement of senior leaders with the weapons designers, scientists, and engineers would go a long way in building trust and confidence in the technical knowledge and expertise of senior leaders."*

Not only does this leadership approach promote trust among the work force, but it also instills leadership trust and confidence in the workforce and in their ability to accomplish the mission.

## Risk Management

Data collected from a review of recent literature reveals that NNSA lacks a clear mechanism or single responsible official to access and accept risk (Congressional

Advisory Panel 2014). Similarly, four out of five case study respondents indicate that risk management is an area of opportunity for culture change. Specifically, the respondents emphasized establishing defined roles and authority as the area of focus.

### *Defined Roles and Authority*

Although it appears NNSA is moving away from its risk adverse culture, majority of the case study respondents remarked that clearly defined roles and authority is a continual risk management issue within the organization. One respondent explains the NNSA's risk management issues in the following manner:

> *"The culture is very risk averse. No one seems to want to accept liability or responsibility. [Consequently] NNSA transfers the risk downward."*

Not only does the resistance to accept responsibility and liability cause a malapportionment of risk, it creates work inefficiencies. For example, as one respondent illustrates:

> "*If NNSA Headquarters wants something accomplished, it passes instructions through the field office. The field office not only passes down what headquarters wants accomplished, but has additional things it wants accomplished as well. It is not clear who is in charge. Plus trying to appease different people with different interests is difficult.*"

However, as one respondent suggests, by giving people responsibilities that match authority and then holding them accountable, risk is spread evenly throughout the organization and inefficiencies are tempered.

Attracting and Retaining Highly Skilled Personnel

Although not specifically cited as a current cultural challenge by the case study respondents, attracting and retaining highly skilled personnel provides an opportunity for enduring cultural change. According to data gathered during a site visit, approximately 35 percent of the current workforce will be retirement eligible in the next five years. Moreover, as one respondent recounted:

> *"The current culture consists of a bi-modal distribution with large numbers of employees in the older generation and large numbers in the younger generation."*

Figure 10 depicts the bi-modal distributed workforce. This distribution presents some risk because of the gap in experience. However, there are opportunities to manage the risk through knowledge transfer and mentoring (National Nuclear Security Administration 2015).

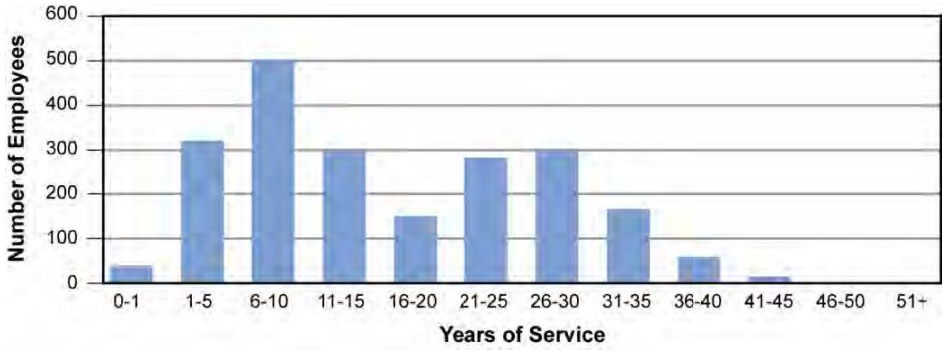



**Figure 10. NNSA Federal Employees by Years of Service**
**(Source: NNSA's FY 2016 SSMP)**

A similar challenge that provides opportunities for cultural change is the number of employees who elect to leave NNSA with less than ten years of service. Figure 11 illustrates the distribution of the data.

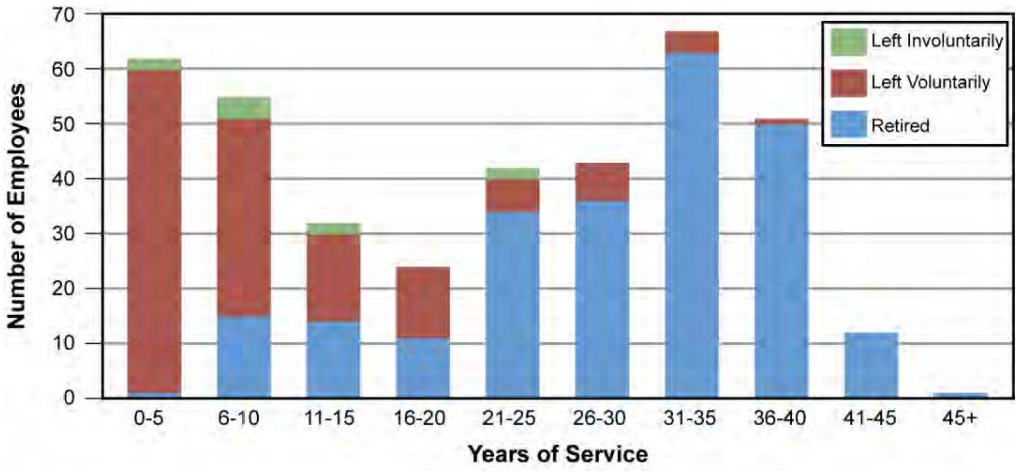



**Figure 11. Years of Service of Federal Employees Who Left NNSA**
**(End of FY 2012 to End of FY 2014; Source: NNSA's FY 2016 SSMP)**

*Get Individuals Invested Early*

When questioned about the best way to attract and retain highly skilled personnel, four of five respondents commented on the importance of getting individuals invested early. One respondent remarked that:

> *"To get somebody invested early, we need to start targeting kids out of high school and early in college. We need to focus on identifying kids early in their college career and get them interested into getting masters and PhDs in science and engineering."*

The added benefit to getting individuals invested early is that the individuals develop and adjust better and quicker.

***Investigative Question 5***

The fifth investigative question aims to identify the barriers to cultural change. To understand the cultural change barriers within NNSA, the researcher asked the case study respondents to comment on what they see as barriers to holding individuals

accountable, the flow of communication. And attracting and retaining highly skilled personnel. Table 4 depicts the various barriers highlighted by the case study respondents.

**Table 4. Barriers to Cultural Change**

| | | Respondent | | | | |
|---|---|---|---|---|---|---|
| **Barriers** | | **A** | **B** | **C** | **D** | **E** |
| Accountability | | | | | | |
| | Risk | | | X | X | X |
| | M&O contract strategy | | X | | | X |
| Communication | | | | | | |
| | Trust | | | | X | X |
| | System atrophy | X | | | X | |
| Attracting and Retaining Highly Skilled Personnel | | | | | | |
| | Security clearance | X | X | X | | X |
| | Work environment | X | | X | | |
| | Civilian sector job opportunities and benefits | X | | X | X | X |

Overall, the respondents had diverse views on barriers to cultural change. Interestingly, the barriers to attracting and retaining highly skilled personnel were the most commonly mentioned barrier to cultural change. The following paragraphs discuss these barriers.

## Attracting and Retaining Highly Skilled Personnel

As illustrated in chapter 1, a key component of an effective deterrent is a strong cadre of highly skilled and qualified scientists and engineers (Turpen 2009). Perhaps this explains why the barriers to attracting and retaining a highly skilled workforce garnered so much attention. Each respondent commented on at least one of the three barriers. Respondents A and C addressed all three. However, four of five respondents seemingly agreed that security clearances and job opportunities in the civilian sector are the most

pressing barriers to attracting and retaining highly skilled personnel. The following sections discuss these barriers in greater detail.

### *Security Clearance*

Given the nature of work conducted within the nuclear enterprise, it is imperative that a worker possess the proper security clearance. Without the proper clearance, he or she is not granted access to the work area. However, obtaining a security presents some challenges, as one respondent explains:

> *"One of the top three, if not the number one barrier to attracting high skilled individuals is the backlog on security clearances. It currently takes about one year to eighteen months to obtain a clearance. The challenge is finding ways to keep new hires busy for a year to eighteen months, since they cannot do the work they were hired to do without a clearance."*

According to another respondent, without a security clearance personnel cannot begin the certification process into the Human Reliability Program (HRP), which is a requirement to work with nuclear weapons. Thus, this only further keeps new hires from doing the jobs they were hired to do. Consequently, the arduous security clearance process often makes jobs at one of the NNSA's laboratories or production plants unattractive.

### *Civilian Sector Job Opportunities and Benefits*

Similar to security clearances, another barrier to attracting and retaining highly skilled workers is the enticing job opportunities and benefits offered in the civilian sector. One respondent explains the struggle in this way:

> *"The economy is better, which entices candidates to seek higher pay elsewhere, such as Apple and Google. Also, at about the five year mark, people leave the lab for better jobs."*

While the anticipation of higher pay entices potential candidates to seek employment elsewhere, the benefits of job location also play a significant role in the hiring and retention process. As one case study respondent commented:

> *"Geography presents some challenges because some of the facilities are located in remote and less desirable areas."*

The added dimension of remote job locations especially becomes a deterrent factor to those who have spouses that also work and may not be able to find suitable employment at those locations.

### *Investigative Question 6*

The final question seeks to understand the benefits of cultural change and their impact on the long-term effectiveness of the nuclear enterprise. Chapter 5 discussion and conclusions addresses this question in further detail.

## Summary

This chapter discussed the research findings related to the investigative questions of this research. Specifically, the findings of this research uncovered the current organizational cultural challenges facing DOE. Next, a qualitative analysis of the case study respondents' comments highlighted the opportunities that exist for enduring cultural change within NNSA. Finally, this chapter identified and discussed the significant barriers to cultural change. The next chapter presents some overall

conclusions about the results of this research, in an effort to address the benefits of cultural change and their impact on the long-term effectiveness of the nuclear enterprise.

# V. Conclusions and Recommendations

## Chapter Overview

This chapter presents some overall conclusions about the results of this research, in an effort to address the benefits of cultural change and their impact on the long-term effectiveness of the nuclear enterprise.

## Conclusions and Significance of Research

This research lays the framework for the long-term effectiveness of the nuclear enterprise. The primary motivation for this research is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, called into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Similarly, the current uncertain and changing strategic security environment, shrinking budgets, and aging nuclear force structure and nuclear production complex, raise questions as to the long-term effectiveness and credibility of the U.S. nuclear deterrent. Thus, this research addresses the overarching question, "How does the current DOE organizational culture impact the long-term effectiveness of the nuclear enterprise?"

This focus of this research is on the cultural challenges of the DOE. This is appropriate because culture forms the foundational shared values, expectations, and attitudes that govern organizational operations and processes. Organizations operate efficiently only when there are shared values among the employees. "Because

organizational culture involves shared expectations, values, and attitudes, it exerts influence on individuals, groups, and organizational processes" (Gibson, et al. 2012).

A review of recent and historical literature chronicles a litany of cultural issues dating back to DOE's assumption of the nuclear weapons mission from the Atomic Energy Commission. These issues arose from melding two entirely different cultures together, resulting in management approaches, which hindered the effectiveness of the nuclear weapons program (Defense Science Board 2006). In response to the growing issues, DOE implemented various organizational reforms; with very little success. Consequently over the last two decades several studies, boards, and reviews were assembled to address the issues. The literature review highlights a trail of oft repeated findings and recommendations, none of which brought about the desired change. The primary reason many of these efforts failed is that they addressed the symptoms of the underlying cultural issues rather than the issues themselves. Rather than focusing on influencing cultural change, they focused on changing structure and processes. Contrary to previous studies, this research addresses the underlying cultural issues necessary to lay the framework for cultural change that ensures the long-term effectiveness of the nuclear enterprise.

This research employs high reliability organization theory as the framework to analyze the organizational culture of DOE. The key elements of high reliability organization theory this study uses in this examination are (1) preoccupation with failure, (2) reluctance to simplify interpretations, (3) sensitivity to operations, (4) commitment to resilience, and (5) deference to expertise. The premise of this theory is that an organization with these characteristics possesses the mindset and culture

necessary for effective implementation of organizational improvement strategies (Hines, et al. 2008). According to the cultural analysis discussed in chapter 4 and research findings, DOE exemplifies all of these characteristics. For instance, a saying at one of NNSA's laboratories is "Don't just trust the requirements, seek the data." Similarly, when it comes to safety issues, it is mandatory that these are handled by subject matter experts at the various agencies within NNSA. These are two examples highlighting how NNSA embodies the high reliability organization theory (HROT) characteristics of preoccupation with failure and deference to expertise. The data collected uncovered other similar examples to support the other HROT characteristics.

Establishing DOE as a high reliability organization means it possesses the mindset necessary for cultural change and other organizational improvement strategies. Important to note, however, is that culture change is difficult to do and often takes a long time and requires persistent effort. To affect cultural change, one must take steps to change the behavior of individuals in the organization. Changing behavior alone, however, will not necessarily bring about cultural change. Individuals in an organization need to understand the benefit and reason to change their behavior. Effective communication is a necessary bridge to understanding (Gibson, et al. 2012). However, effective communication requires "redundancy and multiplicity to connect to various learning styles" (Ellis 2012). The more one communicates the message, the more the organization understands and values a change in behavior (Gibson, et al. 2012).

For nearly two decades, a culture of apathy, neglect, and risk aversion toward the nuclear weapons mission permeated the DOE nuclear complex. Despite many

efforts to shift course, the culture remained unchanged. An analysis of the data presented in chapter 4 of this research suggests a shift in NNSA's culture away from these very risk averse measures to a more neutral approach. While many issues continue to challenge NNSA culture, it appears things are progressing in the correct direction. At stage DOE and senior national leaders need to be mindful in their change management strategies and not implement numerous drastic changes. Otherwise they may upset the balance of the culture and never realize the desired goals. Data gathered from recent literature highlights this as a symptomatic issue over the course of the last decade and suggests this as a possible reason the desired change within DOE was never realized. As one piece of literature states:

> *"On the one hand, too much change within too short a time-span overwhelms people with learning new ways-of-working and interacting. Too much change and failing to lead people through transition almost guarantees that transformation will not happen. On the other hand, if there is too little change, or if the changes are not focused on the underlying common causes in the organization's structures, systems, and culture, organizational transformation won't happen either. Multiple initiatives that create too little change fatigue organizational morale and undermine trust because managers and staff members come to view these failed attempts cynically as the 'flavor of the month'"* (Bodnarczuk 2012).

Thus, effective and successful change management strategies must focus on the underlying cultural issues, be flexible, and have the capacity to provide adequate time, education, and resources to obtain and sustain essential support from all individuals involved (Kaminski, 2011).

**Recommendations for Action**

To provide a framework of enduring cultural change, this research makes several recommendations. The overarching recommendation is that NNSA and the nuclear

weapons mission remain resident within DOE. Numerous previous studies recommend NNSA become its own agency outside the construct and purview of DOE. Similarly, there those studies that suggest moving the nuclear mission under the Department of Defense (DOD) control. While these options may alleviate the issue of competing mission areas, they do not address the underlying culture issues resident within NNSA. In fact they may exacerbate the issues further; such is the case with the DOD option. Although NNSA and DOD share the nuclear mission, the cultures resident in each organization are polar opposites of one another. Attempting to merge them together may only further intensify the cultural issues within NNSA. In fact there is historical precedent to this fact. During the Manhattan Project, friction often existed between the scientists and the Army, often over matters of security (Rhodes 1986). To assume that this time is any different is an allusion that will only cost money and further issues. Thus, only through proper change management strategies that focus on these cultural issues will bring about the enduring change necessary for a long-term effective enterprise. To bring about this desired end state there are three areas of focus: accountability, communication, and attracting and retaining highly qualified individuals.

### *Accountability*

As the findings in chapter 4 reveal, NNSA needs greater accountability in order to properly manage risk. First and foremost, NNSA needs to clearly define roles and authorities throughout the organization. Employees need to know and understand who is in charge, otherwise there is confusion and competing priorities, resulting in inefficient

operations. Similarly, individuals within an organization want to feel meaningful. Thus, as one case study respondent explains:

> *"People need to be given responsibilities that match authority and then held accountable to them."*

Properly defined roles and authorities alleviate confusion and clarify who assumes the risk. Most importantly, clearly defined roles and authorities permit mission focused and efficient operations.

### *Communication*

Data collected from case study interviews and literature review highlight communication as an opportunity for meaningful cultural change. Communication starts from the top. For lasting and meaningful change to take shape, it is imperative senior level leaders communicate guidance, goals, plans, and initiatives to the workforce. Within the nuclear enterprise this starts with senior national leaders. Senior leaders at the national level need to provide clear guidance and direction for the future of the enterprise. Currently, there is a lack of consensus among senior national leadership as to the role nuclear weapons play in the U.S. policy. Thus, there is a deficit in clear guidance of how the nuclear enterprise should look and be shaped for the future. Similarly, for the nuclear enterprise to flourish long-term, it needs the support of senior national leadership. While the enterprise currently garners more support than in recent past, more needs to be done. There remains a lack of consensus among senior national leaders regarding the role of the enterprise. Consequently, this negatively affects funding for stockpile stewardship programs. The recommended course action, therefore, is to provide greater advocacy and

education on the importance of a healthy and effective nuclear stockpile. This should be done early in an administration, even prior to the on-coming administration taking office.

Similarly, as the findings in chapter 4 indicate, senior leaders within NNSA can do more to foster trust-based relationships. An effective way to build these relationships is to manage by walking around the various work areas. Not only does it convey a message that the senior leader is engaged and cares about the mission and the people doing it, but it also gives leadership the opportunity to identify any issues within the organization, which may not make up the chain of command. Therefore, NNSA leadership must to take steps to engage the workforce, such as the scientists, engineers, and weapon designers. While communication is important, it must not be one-way. Listening to the ideas, feelings and desires of the employees affected by the change creates trust and fosters an attitude of engagement and importance (Levasseur, 2010).

### *Attracting and Retaining Highly Skilled Individuals*

A key component of an effective deterrent is a strong cadre of highly skilled and qualified scientists and engineers (Turpen 2009). However, as the findings of this research show, NNSA faces several challenges in hiring and retaining a highly skilled workforce. Many of these challenges were discussed in chapter 4. In light of the challenges, this research suggests a couple of recommendations to build the pool of qualified candidates. First, since NNSA cannot compete with the civilian sector in terms of pay and benefits, NNSA, as one respondent remarks, "must appeal to people's patriotic side." People have a general motivation to belong to something great. Therefore, NNSA needs to convey that working at one of the national laboratories or production facilities

and in the nuclear deterrence mission is worth being part of. Thus, a recommendation for NNSA is to be more adamant with advertising its successes and programs. Success breeds excitement and excitement breeds participation. Also important is making the connecting link of those successes to the accomplishment of national security objectives.

A second recommendation is for NNSA to engage prospective candidates early while they are still in high school or freshmen in college. One method of doing this is through scholarship or intern programs. By getting candidates invested early, they are not only more likely to enter the workforce pool, but the transition to workforce will be smoother and they will develop quicker.

By implementing these recommendations, NNSA will take advantage of necessary cultural change opportunities that will provide for the long-term effectiveness and credibility of America's nuclear deterrent.

**Recommendations for Future Research**

This research covered a limited scope with regard to the organization of DOE. For example, this research did not address the budget aspect of the organization. Thus, an area for recommended future research is to explore the budgeting process; focusing specifically on cost-plus contracts. In recent months cost-plus contracts have come under scrutiny from congressional leaders (Glabe, Plitsch and Brown 2015). Therefore it is worth exploring; in order to determine if it is the most cost effective and flexible method to fund contracts.

Another area for future research is to explore the Department of Energy's Management and Operating (M&O) contract strategy. According to one of the research

case study respondents, the current M&O contract strategy is ill-suited for properly holding contractors accountable for poor performance. Additionally, the respondent suggests that NNSA needs a better contract strategy that is not reliant on an award fee. Thus, a proposed are for future research is to explore alternative contract strategy options that are conducive to holding contractors accountable for the work they perform.

**Summary**

This chapter presented some overall conclusions about the results of this research, in an effort to address the benefits of cultural change and their impact on the long-term effectiveness of the nuclear enterprise. The primary motivation for this research is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, called into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. However, misapplied change management strategies over the past decade fostered a culture of risk aversion, which greatly hindered the nuclear weapons mission. To effectively enact change, change management strategies must focus on the underlying cultural issues rather than structures or processes. Therefore, this research provides courses of action for meaningful cultural change in the areas of accountability, communication and attracting and retaining highly skilled individuals. By implementing these recommendations, NNSA will take advantage of necessary cultural change opportunities that will provide for the long-term effectiveness and credibility of America's nuclear deterrent.

# Appendix A. Organization Chart

## Atomic Energy Organization Chart

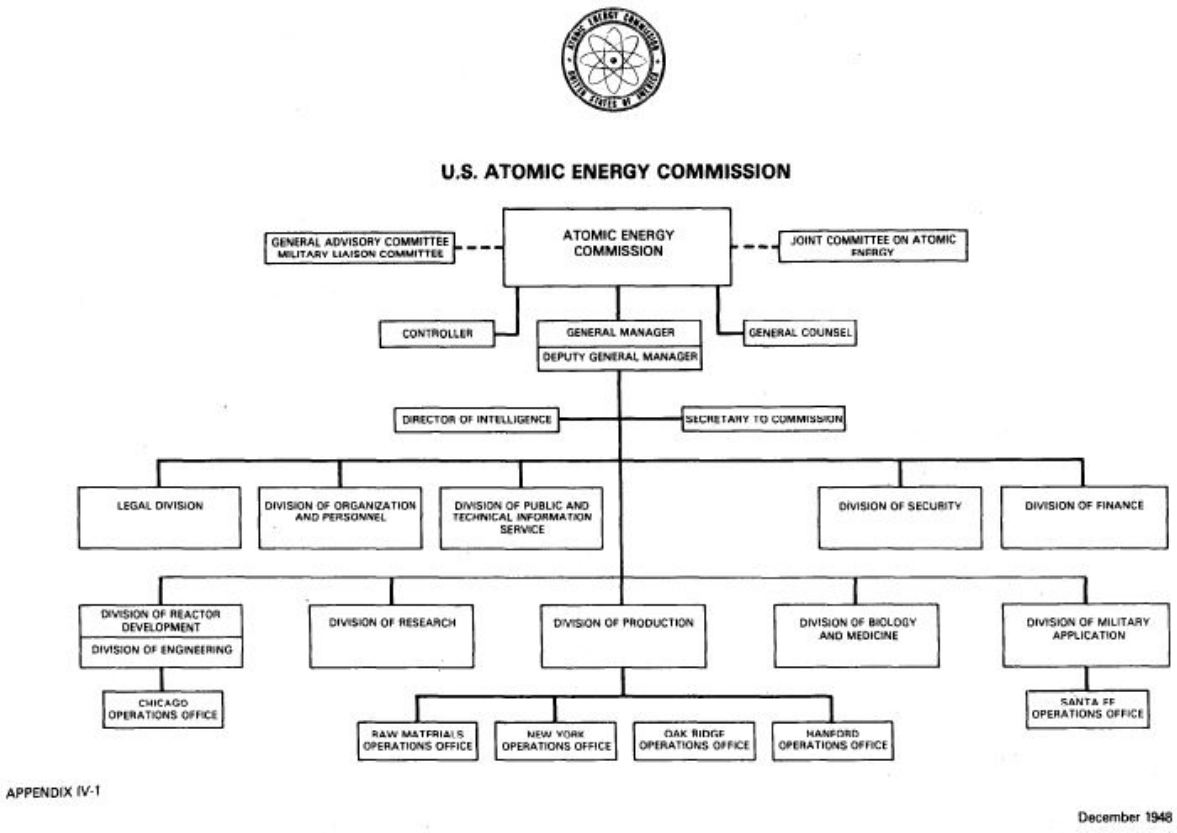



**Figure 12. AEC Organization in 1948**

## Appendix B. Nuclear Security Enterprise Overview

### National Security Laboratories

#### *Lawrence Livermore National Laboratory*

**Figure 13. Lawrence Livermore National Laboratory**

Lawrence Livermore National Laboratory (LLNL) is located in Livermore, California, where it was founded in 1952. LLNL is one of two national security laboratories within the nuclear security enterprise that designs the nuclear components of the Nation's weapons. The LLNL mission is to develop and sustain design, simulation, modeling, and experimental capabilities and competencies to ensure stockpile confidence without nuclear testing. LLNL is responsible for nuclear design activities in support of the B83, W80, W84, and W87 legacy systems and for nuclear design of the W78/88-1 and the cruise missile warhead LEP (recently designated the W80-4). LLNL's additional core capabilities include plutonium R&D; tritium operations and R&D; high explosives (HE) R&D; and nuclear counterterrorism and nonproliferation (National Nuclear Security Administration 2015).

***Los Alamos National Laboratory***

**Figure 14. Los Alamos National Laboratory**

Los Alamos National Laboratory (LANL) is located in Los Alamos, New Mexico, where it was founded in 1943 as part of the Manhattan Project. LLANL is the second of the two national security laboratories within the nuclear security enterprise that designs the nuclear components of the Nation's weapons. The LANL mission is to develop and sustain design, simulation, modeling, and experimental capabilities and competencies to ensure stockpile confidence without nuclear testing. LANL is responsible for the nuclear design and engineering of the B61, W76, W78, and W88 legacy systems, as well as the W76-1 and B61-12 LEPs. In addition, LANL provides the only fully functioning plutonium facility used for R&D and the only pit manufacturing capability within the nuclear security enterprise. LANL's additional core missions include tritium and HE R&D; detonator, power supply, and other non-nuclear component production and testing; special nuclear material (SNM) accountability, storage, protection, handling, and disposition; and nuclear counterterrorism and counter-proliferation (National Nuclear Security Administration 2015).

### *Sandia National Laboratories*

**Figure 15. Sandia National Laboratories**

Sandia National Laboratory (SNL) has two locations. One laboratory is located in Albuquerque, New Mexico and the other in Livermore, California. SNL was founded in 1945 as the ordnance design, testing, and assembly arm of the Manhattan Project. Today SNL is the national security laboratory uniquely responsible for the systems engineering and integration of the nuclear weapons in the stockpile and for the design, development, qualification, sustainment, and retirement of non-nuclear components for nuclear weapons. SNL's additional core missions include neutron generator and other non-nuclear component production; HE and energetic materials R&D; counterterrorism and counter-proliferation; and engineering, design, and technical systems integration for the NNSA Office of Secure Transportation (National Nuclear Security Administration 2015).

## Nuclear Weapons Production Facilities

### *National Security Campus at Kansas City*

**Figure 16. Kansas City National Security Campus**

Kansas City National Security Campus (NSC), formerly called the Kansas City Plant, is located near Kansa City, Missouri. The original plant was built in 1942 to build WWII airplane engines. In 1949, the plant began to manufacture non-nuclear weapon system components. Today, NSC remains the main production site for non-nuclear weapon components. NSC manufactures and procures many of NNSA's most intricate and technically demanding components, including radar systems, mechanisms, programmers, reservoirs, joint test assemblies, engineered materials, and mechanical cases. These components make up approximately 85 percent of the elements that constitute a nuclear weapon (National Nuclear Security Administration 2015).

***Pantex Plant***

**Figure 17. Pantex Plant**

The Pantex Plant is located near Amarillo, Texas, where it was constructed in 1942 to load artillery and bombs during WWII. In 1952, Pantex shifted its efforts to support nuclear capabilities during the Cold War. Today, Pantex's mission includes four core areas: national security, nuclear explosive operations, nuclear material operations, and high explosive (HE) operations. To accomplish this mission, Pantex manufactures and tests HE components (the main charge and other components); assembles; disassembles; refurbishes; repairs; maintains; and conducts surveillance of stockpile weapons and weapon components. The plant also fabricates joint test assemblies; performs postmortems; assembles and disassembles test beds; conducts interim staging and storage of nuclear components from dismantled weapons; and performs pit requalification, surveillance, and packaging (National Nuclear Security Administration 2015).

***Savannah River Site***

**Figure 18. Savannah River Site**

Savannah River Site (SRS) is located in Aiken, South Carolina, where it has been operational since 1952. SRS is currently the only domestic site that supplies the radioactive hydrogen gas, tritium, and gas transfer system (GTS) components for nuclear weapons. This activity is an integral part of the maintenance of the stockpile and the nation's nuclear defense. SRS's primary tritium-related mission activities include extracting tritium from irradiated target rods and managing the tritium inventory for the nuclear stockpile; replenishing the tritium in the GTSs of stockpile weapons; performing surveillance of GTSs to support annual certification of the stockpile, recovering helium-3, which is a byproduct of tritium's radioactive decay; and conducting research and development (R&D) of tritium gas processing and GTSs (National Nuclear Security Administration 2015).

***Y-12 National Security Complex***

**Figure 19. Y-12 National Security Complex**

The Y-12 National Security Complex is located in Oak Ridge, Tennessee, where it was constructed in 1943. Y-12 serves as NNSA's Uranium Center of Excellence as it is the Nation's only source for enriched uranium components for nuclear weapons. The main mission activities for the Y-12 complex is to manufacture uranium components for nuclear weapons, cases, and other nuclear weapons components; and to evaluate and test these components for surveillance purposes. Furthermore, Y-12 serves as the main storage facility for Category I/II quantities of highly enriched uranium (HEU); conducts dismantlement, storage, and disposition of HEU; and supplies HEU for use in naval reactors (National Nuclear Security Administration 2015).

## The Test Site

### *Nevada National Security Site*

**Figure 20. Nevada National Security Site**

The Nevada National Security Site (NNSS) is located near Las Vegas, Nevada. NNSS' primary mission is to provide the necessary facilities, infrastructure, and personnel to support the national security laboratories and other organizations in performing the essential nuclear and non-nuclear experiments to maintaining the stockpile. NNSS is the primary location within the nuclear enterprise where experiments using radiological and other high-hazard materials are conducted. Similarly, it is the only location where high explosive-driven subcritical plutonium experiments are performed. These experiments serve the following end-states: to enhance predictive capability; challenge next-generation weapon designers; and to build confidence in assessing the stockpile and certifying weapons modernized through life extension programs (LEPs) (National Nuclear Security Administration 2015).

## Appendix C. IRB Exemption Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OHIO

8 July 2016

MEMORANDUM FOR JEFFREY OGDEN, PHD

FROM: William A. Cunningham, Ph.D.
AFIT IRB Research Reviewer
2950 Hobson Way
Wright-Patterson AFB, OH 45433-7765

SUBJECT: Approval for exemption request from human experimentation requirements (32 CFR 219, DoDD 3216.2 and AFI 40-402) for your study, An Investigation into the Organization and Culture of the National Nuclear Security Administration.

1. Your request was based on the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2) Research activities that involve the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

2. Your study qualifies for this exemption because you are not collecting sensitive data, which could reasonably damage the subjects' financial standing, employability, or reputation. Further, the demographic data you are utilizing and the way that you plan to report it cannot realistically be expected to map a given response to a specific subject.

3. This determination pertains only to the Federal, Department of Defense, and Air Force regulations that govern the use of human subjects in research. Further, if a subject's future response reasonably places them at risk of criminal or civil liability or is damaging to their financial standing, employability, or reputation, you are required to file an adverse event report with this office immediately.

WILLIAM A CUNNINGHAM, PH.D.
AFIT Exempt Determination Official

## Appendix D. National Nuclear Security Administration Interview Questions

**CONSENT TO PARTICIPATE IN INTERVIEW**

*INVESTIGATION INTO THE ORGANIZATION AND CULTURE OF NNSA*

You have been asked to participate in a research study conducted by researchers from the Air Force Institute of Technology (AFIT), Graduate School of Engineering and Management, Department of Operational Sciences. The main objective of the project is to conduct interviews with managers in the NNSA to garner expert opinions regarding the challenges facing the organization and their impact on the nuclear enterprise. The results of this study will be included in a report and briefing to the AFGSC staff, as well as research publications. You were selected as a possible participant in this study because of your knowledge of and role within NNSA. You should read the information below and ask questions about anything you do not understand before deciding whether or not to participate.

- This interview is voluntary. You have the right not to answer any question, and to stop the interview at any time or for any reason. I expect that the interview will take 30-60 minutes.
- You will not be compensated for this interview.
- The information that you share will be kept confidential. All data will be presented at an aggregate level.
- This project will be completed by August 2016. All interview documents will be stored in a secure work space until 1 year after that date. The documents will then be destroyed.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

(Please initial)

[ ] I give permission for this interview to be recorded and transcribed.

Name of Subject:

Signature of Subject _____Date _____

Signature of Investigator _____Date _____

Please contact Maj Pabst with any questions or concerns at david.pabst.1@us.af.mil or (505) 846-9314.

## INTERVIEW QUESTIONS FOR NNSA REPRESENTATIVES

### PERSONAL DATA

Name: _____ Job Title: _____

Years with the organization: _____ Years in current position: _____

E-mail address: _____ Phone Number: _____

### GENERAL ORGANIZATION INFORMATION

1. What are the key challenges your organization is currently facing?
    - Internal to organization
    - External to organization

2. How would you describe the overall culture of your organization?

### MORALE WITHIN THE ORGANIZATION

3. How would you rate the morale within the organization?

| Poor | Fair | Good | Excellent |
|---|---|---|---|
| ○ | ○ | ○ | ○ |

3a. If poor or fair, what are the factors adversely affecting morale?

3b. What do you think can be done to fix/improve morale within the organization?

3c. What would be the perceived benefit of these fixes and how would you measure the impact they have on morale?

### ACCOUNTABILITY WITHIN THE ORGANIZATION

4. How are individuals held accountable for the quality of their work within the organization?

4a. What procedures are in place if the work does not get done in a timely manner or if the quality of work is not up to standards?

4b. How do you quantify or measure if the work being performed is not up to standards?

4c. If necessary, what procedural changes would you recommend to better hold individuals accountable?

4d. What added benefit do you see to these changes and how would you measure or quantify the effectiveness of those changes?

**ORGANIZATIONAL LEARNING/IMPROVEMENT**

5. How does learning and improvement within the organization take place?

5a. How is learning within the organization measured and managed?

5b. What barriers, if any, do you see to learning and improvement within your organization?

5c. What fixes would you recommend to improve learning within your organization?

5d. What benefits would they serve and how would you quantify those benefits?

**COMMUNICATION WITHIN THE ORGANIZATION**

6. How freely does information flow up, down, and laterally across the organization?

6a. What obstacles, if any, prevent information (bad or good) from moving throughout the organization?

6b. What mechanisms would you put in place to address these obstacles?

6c. What would be the added benefit of these mechanisms and how would you measure their success?

**HIGHLY SKILLED AND EXPERIENCED PERSONNEL**

7. How does the organization attract and retain highly skilled personnel?

7a. What are the greatest barriers you see in attracting and retaining highly skilled personnel?

7b. What do you think can be done to attract young talent and to incentivize those currently employed to stay?

7c. What are the added benefits to the organization and how would you measure those benefits?

# Department of Energy: An Organizational Look At America's Nuclear Deterrent

**How does the current DOE organizational culture impact the long-term effectiveness of the nuclear enterprise?**

Maj David "Smear" Pabst
Advisor: Jeffrey A. Ogden, PhD
Advanced Nuclear Deterrence Studies (ENS)
Air Force Institute of Technology

## Abstract

The primary motivation for this research is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, called into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Similarly, the current uncertain and changing strategic security environment, shrinking budgets, and aging nuclear force structure and nuclear production complex, raise questions as to the long-term effectiveness and credibility of the U.S. nuclear deterrent.

A literature review and case study interviews with mid-level managers provide valuable insight into DOE organizational cultural challenges. The results from the literature review and interviews were analyzed and presented. This research highlights that while DOE's culture is improving, opportunities exist for meaningful cultural change. Capitalizing on these opportunities provides for the long-term effectiveness and credibility of America's nuclear deterrent.

## Research Goals

Qualitative research (specifically case study research) was used based on the ability to garner meaningful insight to provide a holistic picture of the study's topic. Case study research is valuable for researchers to interpret and define complex situations. Supporting the overarching research question, this study incorporated six investigative questions.

**IQ1. What role does DOE play in the nuclear enterprise?**

**IQ2. How is DOE organized?**

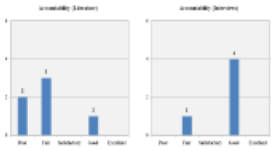
**IQ3. What current organizational cultural challenges does DOE face?**

**IQ4. What opportunities exist for enduring cultural change?**

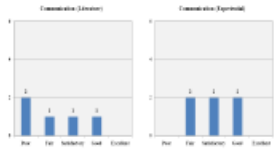
**IQ5. What are the barriers to cultural change?**

**IQ6. What are the benefits of cultural change to the long-term effectiveness of the nuclear enterprise?**

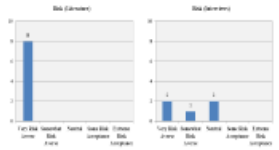
NNSA CULTURAL CHALLENGES



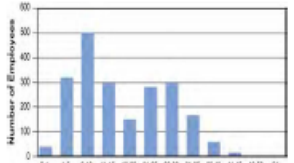
Level of Accountability in NNSA



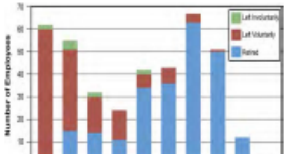
Flow of Communication in NNSA



NNSA's Risk Culture



NNSA Federal Employees by Years of Service



Years of Service of Federal Employees Who Left NNSA
(End of FY 2012 to End of FY 2014)

OPPORTUNITIES FOR CULTURAL CHANGE

| | | Respondent | | | | |
|---|---|---|---|---|---|---|
| | Opportunities | A | B | C | D | E |
| Accountability | | | | | | |
| | Better M&O contract strategy | | X | | | X |
| Communication | | | | | | |
| | Foster trust-based relationships | X | X | | X | X |
| | Connect mission with work being done | | | X | X | |
| Risk Management | | | | | | |
| | Define clear roles and authority | | X | X | X | X |
| Attracting and Retaining Highly Skilled Personnel | | | | | | |
| | Better pay and compensation | X | | X | X | |
| | Get individuals invested early | X | X | | X | X |

BARRIERS TO CULTURAL CHANGE

| | | Respondent | | | | |
|---|---|---|---|---|---|---|
| | Barriers | A | B | C | D | E |
| Accountability | | | | | | |
| | Risk | | | X | X | X |
| | M&O contract strategy | | X | | | X |
| Communication | | | | | | |
| | Trust | | | | X | X |
| | System atrophy | X | | | X | |
| Attracting and Retaining Highly Skilled Personnel | | | | | | |
| | Security clearance | X | X | X | | X |
| | Work environment | X | | X | | |
| | Civilian sector job opportunities and benefits | X | | X | X | X |

## Methodology

To identify and understand NNSA's organizational cultural challenges and their impact on the effectiveness of the nuclear deterrent mission, this research employed the case study research method. Through a case study, this research obtained data and insights on the effectiveness of the current organizational structure of NNSA using multiple collection methods. First, this case study conducted an analysis of the existing literature on the organizational culture of NNSA. Second, this study applied observatory insights from site visits to various agencies within NNSA. Third, and primary data collection method consisted of focused interviews of middle management level employees across the organization designed to obtain their perspective on the characteristics of NNSA's organizational culture.

The research used a content analysis to identify and understand underlying themes in the data in an effort to create a framework for the long-term effectiveness of the nuclear enterprise

## Recommendations

The underlying issues in NNSA are cultural. Indications signify the recovery of the nuclear enterprise from years of neglect. However, to bring about the long-term effectiveness of the enterprise, NNSA needs to focus on the following areas: accountability, communication , and attracting and retaining highly qualified individuals.

1. Accountability: To permit mission focused and efficient operations, NNSA needs to clearly define roles and authorities throughout the organization and then hold people accountable .
2. Communication: For lasting and meaningful change, national senior leaders need to provide guidance and direction for the future of the nuclear enterprise. Similarly, NNSA senior leaders need to do more to foster trust-based relationships by increasing engagement of the workforce .
3. Attracting and retaining highly skilled individuals: Since NNSA cannot compete with the pay and benefits of civilian industry, NNSA must appeal to people's patriotic side. Furthermore, NNSA needs to engage prospective candidates early while they are still in high school or freshmen in college through scholarship or internship programs.

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## Vita

Major David Pabst is a student at the School of Advanced Nuclear Deterrence Studies (SANDS), Air Force Global Strike Command, Kirtland AFB, NM.

Major Pabst entered the Air Force in 2002 and was commissioned through the Air Force Reserve Officers' Training Corps after graduating from Brigham Young University. He is a B-52 Electronic Warfare Officer and has held key leadership positions to include serving as a B-52 instructor and evaluator Electronic Warfare Officer, Formal Training Unit instructor, Flight Commander, and Assistant Director of Operations. Prior to his current assignment, he served as the Bomber Strike Section Team Chief, Joint Functional Component Command for Global Strike, United States Strategic Command, Offutt AFB, Nebraska.

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Air Force Meritorious Service Medal
Air Medal
Air Force Commendation Medal
Air Force Achievement Medal with oak leaf cluster
Combat Readiness Medal
National Defense Service Medal
Afghanistan Campaign Medal with bronze star
Global War on Terrorism Service Medal
Humanitarian Service Medal with bronze star
Nuclear Deterrence Operations Service Medal with “N” device and oak leaf cluster

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The primary motivation for this research is to ensure that the nuclear enterprise remains safe, secure, and effective for many years to come. A safe, secure, and effective nuclear force not only serves as a credible deterrent against U.S. adversaries, but also provides assurance for its allies. A history of failures in safety and security within DOE, however, called into question the credibility of the U.S. nuclear deterrent and DOE's ability to accomplish the mission. Similarly, the current uncertain and changing strategic security environment, shrinking budgets, and aging nuclear force structure and nuclear production complex, raise questions as to the long-term effectiveness and credibility of the U.S. nuclear deterrent.

A literature review and case study interviews with mid-level managers provide valuable insight into DOE organizational cultural challenges. The results from the literature review and interviews were analyzed and presented. This research highlights that while DOE's culture is improving, opportunities exist for meaningful cultural change. Capitalizing on these opportunities provides for the long-term effectiveness and credibility of America's nuclear deterrent.

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